Active Share, Fund Style and Performance

by

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ABSTRACT

The South African unit trust industry was found to display low levels of Active Share compared to international levels. A sample of unit trusts, representing approximately 58.2% of assets under management in the South African general equity fund industry, was selected based on the availability of the information necessary to perform this analysis. The average Active Share demonstrated by the sample of unit trusts has decreased from 60.85% in June 2007 to 55.65% in June 2013. A fund flow analysis confirmed that fund managers' portfolio decisions are highly affected by the risk of outflows and possibility of inflows. Managers faced with a high risk of outflows and low possibility of inflows adjusted their Active Share by approximately double that of managers with a moderate risk of outflows and inflows. A similar result was found when comparing managers experiencing a low risk of outflows and a high possibility of inflows, to managers experiencing a moderate risk of outflows and inflows. Under varying market conditions, unit trusts exhibiting the highest Active Share and tracking error (concentrated stock picker) earned a significantly higher alpha than unit trusts exhibiting the lowest Active Share and tracking error (closet indexer). During the financial crisis and in the subsequent bull market to previous highs, concentrated stock pickers earned a significantly higher alpha than closet indexers. In bull markets breaking through previous highs, concentrated stock pickers earned the lowest alpha. The alpha earned by unit trusts exhibiting the highest level of Active Share was significantly higher than the alpha earned by unit trusts exhibiting the lowest level of Active Share. The benefit of distinguishing between truly active (concentrated stock picker) unit trusts and closet indexer unit trusts is clear.

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1. Introduction

A healthy debate exists within the investing community as to whether an active or passive investment strategy earns a higher return over the long-term. Strong inflows into actively and passively managed funds confirm strong support for both sides of this debate. Generally speaking, passive investing is defined as an investment in an index fund and active investing as investing in all other funds. It appears that the lure of potential short-term returns greater than that of a given benchmark is enough to cloud one's judgement when faced with compelling research by Jensen (1968) and Malkiel (1995), amongst others, which show that active investing, on average and over the long-term, provides lower returns to that of passive investing. When measured correctly, in a perfectly functioning market, the average actively managed fund does underperform the market, net of costs using the definitions mentioned above (Gruber (1996)). Over the long-term, an investor with limited skill is better off investing in an index fund than attempting to pick outperforming stocks. "Paradoxically, when "dumb" money acknowledges its limitations, it ceases to be dumb", (Buffett, 1993) and earns a better return over the long-term.

When considering the initial research findings on the active versus passive topic, detailed in the literature review below, it is perplexing that any long-term investor could opt for an active strategy and yet the fund inflows into actively managed funds continue unabated. Every year the investment community willingly loses a portion of their return to management fees, when compared to the higher return the group could have earned had no layer of management fees been added. It appears that individual investors are willing to take the additional risk for the additional reward even though Jensen (1968) and Malkiel (1995) show that the relationship is not linear.

Cremers and Petajisto (2009) provides an investor with a useful measure known as Active Share, which enables one to more accurately separate truly active funds from their passive counterparts. The measure forms the foundation of this research paper.

Research findings on the active versus passive debate have a direct impact on the deployment of economic reserves, particularly on the savings environment. These findings and conclusions therefore have real economic consequences.

2. Literature Review

2.1. Overview

In the seminal paper regarding the active versus passive debate Jensen (1968) investigated the ability of 115 fund managers over the period 1945 to 1964 to earn risk adjusted returns. The United States of America's mutual fund market was investigated.[1] Jensen's alpha is used as the performance measure which is the return on a portfolio greater that predicted by the capital asset pricing model. "...[T]he expected return on any asset is equal to the risk free rate plus a risk premium given by the product of the systematic risk of the asset and the risk premium on the market portfolio" (Jensen, 1968, p.4). Jensen (1968) concluded that, on average, mutual funds earned an alpha of -0.011 which indicates that the average mutual fund earned about 1.1% less per year than it should have earned given its level of systematic risk. Jensen (1968) also concluded that, "there is little evidence that any *individual* mutual fund was able to do significantly better than that which one expects from mere random chance" (Jensen, 1968, p.1). Jensen (1968) asserted that his conclusions hold even when he[2] measured fund returns gross of management expenses, which indicated that funds were not successful enough to recoup even their brokerage expenses.

Malkiel (1995) examined mutual fund returns from 1971 to 1991 and found that in aggregate funds had underperformed benchmark portfolios when considering returns net and gross of expenses. The funds' alphas were calculated using Jensen's alpha. The mean alpha calculated was -0.06 percent, but is not statistically different from zero. The paper found support for the persistence of mutual fund returns from period to period, especially in the 1970's. Testing was done to establish whether investment strategies could be developed and implemented to exploit the persistence in order to earn abnormal

[1] All studies mentioned in this literature review were performed on data obtained from markets within the United States of America, unless stated otherwise.

[2] All gender pronouns used in this research study can be interpreted as both male and female.

returns. Abnormal returns were earned in the 1970's using a strategy based on the findings from the 1970's, but not during the 1980's. Malkiel (1995) confirmed that the researchers were unable to design a dependable investment strategy by which an investor could consistently earn abnormal returns over the long-term which supports the efficient market hypothesis.

Malkiel (2003) presented the case for, and evidence in favour of, passive investment strategies in all types of investment markets both within and outside of the United States of America. Malkiel (2003) maintained that markets are efficient because, *ex ante,* no clear arbitrage opportunities exist. There appear to be no fundamental or technical trading strategies which will enable investors to beat a passive buy and hold strategy. Malkiel (2003) maintained that even if markets are inefficient a passive strategy would be a winning strategy as investing is a zero sum game. Malkiel (2003) asserted that indexing is an advisable strategy because markets seem to be remarkably efficient in digesting and adjusting to new information and as a result of this efficiency, abnormal returns were not widely or persistently achieved. Malkiel (2003) showed that the median actively managed United States domiciled mutual fund as at 31 December 2001 for a time period of 10, 15 and 20 years had on average produced total returns which had been at least more than 175 basis points lower than the returns from the respective index, after expenses. One must note that the study suffers from survivorship bias and Malkiel (2003) maintained that the non-survivors must have had even poorer records than the surviving funds. Over a 10-year period ending 31 December 2001, 71% of actively managed equity funds had earned total net returns inferior to that of an index fund. The paper also investigated European markets where 69% of funds invested in securities domiciled in Europe were outperformed by the Morgan Stanley Capital International Europe Index over the same period.

Gruber (1996) investigated the puzzling interest and growth in actively managed funds and found that actively managed funds displayed negative performance when compared to a variety of indices.

Gruber used a sample of 270 mutual funds which accounted for 77.2% of the total assets held by common stock funds in existence at the time the sample was constructed (end of 1984). The testing was performed over the period 1985 to 1994. To avoid survivorship bias a "follow the money" approach was utilised; If a policy change took place it was assumed the investor put their money in the average surviving fund and if a fund merged into another fund it was assumed the investor placed their money in the merged fund. The findings indicated that the average mutual fund underperformed the benchmark by 65 basis points per year. Annualised total returns in excess of the market, the single index model and the four factor model were used to estimate returns. Expense ratios for the sample averaged 113 basis points per year. These numbers indicated that active management adds value, but the mutual funds' charge investors more than the value added. Gruber (1996) noted that there were three index funds in existence in the United States in 1985 (assets under management of $527m) which had grown to 26 funds by 1986 (assets under management of $4.4bn). By 1994 there were more than 100 index funds (assets under management of $36.8bn).

Gruber (1996) asserted that investors continue to invest in actively managed funds due to the belief that management expertise is not priced in. Insight can be gained by examining closed-end mutual funds where management expertise is priced in as these funds are typically listed and trade at a price different to the net asset value of the fund. In almost every month in Gruber's (1996) sample period the average price to net asset value ratio was below one. This resulted in investors paying more for assets in open-end funds compared to closed-end funds. After much investigation Gruber (1996) confirmed that closed-end funds have both systematic and non-systematic risk that is different to that of the assets that the funds hold, which partly explains the price difference. In the case of open-end funds, investors are able to obtain above average management expertise in certain cases without paying above net asset value. Gruber (1996) provides a partial explanation for the continued interest and growth in actively managed funds.

In the above papers, mutual funds were used as a proxy for active management. Perhaps the findings in the above papers would be less convincing when it is considered that a significant portion of the sample of mutual funds, used as a proxy for "active" management, may have been mimicking the market portfolio (so called "closet indexation") and in fact the sample is not a true representation of "active" investment management. This research paper, amongst other things, attempts to improve the accuracy of the sample representing active management by categorising funds based on the degree of active management and management style and then investigating whether newly defined actively managed funds can achieve an alpha (returns greater than the respective benchmark). In other words, this research paper tries to refine and better isolate the group of funds which could produce the riches that the average investor is aiming for and in doing so will provide investors with numerous alternative categories to only "active" and "passive".

Grinblatt and Titman (1989) found that it is not surprising that the average mutual fund exhibits negative or no performance from an economic perspective as managers with superior talent should be able to capture the rents from their talent in the form of higher fees or perquisites obtained through higher expenses. The study employed quarterly equity holdings of a large sample of mutual funds that existed for part or all of the 1975 to 1984 period. The holdings were used to construct hypothetical mutual fund returns – returns that the investor would have achieved by purchasing (without transaction costs) the portfolio reported in the funds quarterly reports. The difference between the hypothetical performance and the actual performance is an estimate of the average magnitude of mutual fund transaction costs. Grinblatt and Titman (1989) were also able to quantify the survivorship bias by testing surviving funds, testing all funds and comparing the difference between the two results. The following findings were made: The survivorship bias was estimated at a negligible 0.5%; transactions costs were estimated at between 1% and 2.5% per year depending on the benchmark and are inversely related to size; abnormal performance of funds, measured by gross returns is inversely related to fund size, but,

owing to transaction costs being inversely related to fund size, the actual net returns are unrelated to net asset value; and only the gross returns (in excess of the relevant benchmark) of growth and aggressive growth funds are significantly positive on average.

Grinblatt and Titman (1989) begin to investigate the performance of sub-groups as opposed to the entire "active" investment management group.

Jensen (1968) and Malkiel (2003) concluded that active management and mutual funds underperform the benchmark using Jensen's Alpha and annualised total return measures which indicate that managers on average do not have the skill to achieve an alpha. There is however evidence provided by Gruber (1996), amongst others, that superior portfolio managers do exist. Further evidence is provided when considering the studies performed on mutual fund performance persistence. Grinblatt and Titman (1992) found that there is a positive persistence in mutual fund performance. Edwin, Gruber and Blake (1995) found evidence that high mutual fund return can predict high return in the short run (1 to 3 years). The persistence findings have however been criticised and attributed to survivorship bias and benchmark errors by Carhart (1997) and the momentum effect by Chen, Jegadeesh and Wermers (2000).

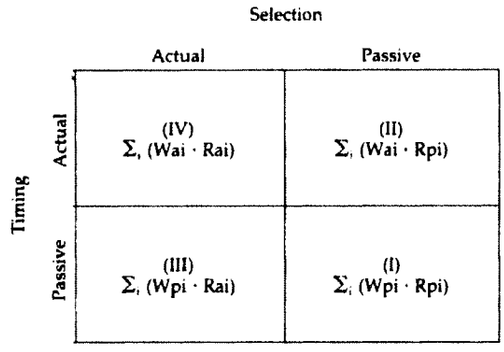
Wermers (2003) and Chen, Jegadeesh and Wermers (2000) investigated the performance of mutual funds by investigating the performance of the underlying stocks held in mutual fund portfolios as opposed to the total net return of the mutual fund (similar to Grinblat and Titman (1989)). Wermers (2000) investigated whether fund managers who actively trade stocks, add value. Performance was decomposed into several components to analyse the value of active fund management and therefore a more precise analysis of active versus passive management was provided. The sample consisted of 1,788 mutual funds over the period 1975 to 1994. Returns were calculated using average annualised net returns. Wermers (2000) found that mutual funds, on average, held stocks that outperformed the

broader market index by 130 basis points per year. There was however a 230 basis point difference between the returns by the mutual funds holdings and net returns for the mutual fund. 70 basis points were explained by the lower than average returns on non-stock holdings. The remaining 160 basis points were split evenly between the expense ratios and transaction costs of the funds. The study also found that high-turnover funds, while incurring substantially higher costs and therefore charging higher expenses, also held stocks earning higher average returns than low-turnover stocks. At least a portion of this skill can be attributable to substantially better stock picking skills. Wermers (2000) begins to provide one with a more refined investigation into active versus passive investing and the factors contributing to the average negative alpha achieved by mutual funds.

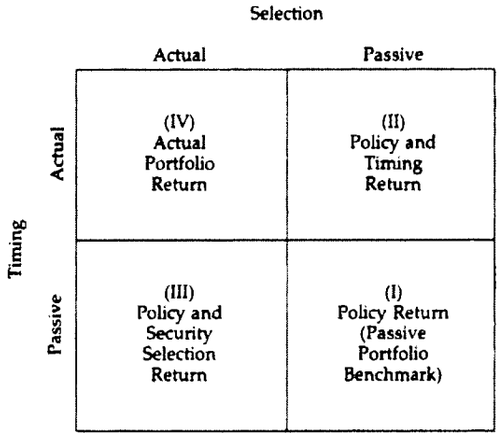
Chen, Jegadeesh and Wermers (2000) also investigated the value of active management by looking at the holdings and trades of mutual funds. Investigating the performance of stocks held and traded by a large group of mutual funds examines whether the consensus opinion of the industry reveals superior information regarding the value of a share. They expected active stock trades to represent a stronger opinion regarding the value of a share compared to passive holdings of the same share. The study covered 2,424 funds over the period 1975 to 1995. Measures such as FracHoldings (Number of shares held in company *i* over the total number of available shares in company *i*), Trades (FracHoldings for company *i* at time *t* less FracHoldings for company *i* at time *t-1*) and Turnover (Total number of purchases and sales of company *i* shares over the average total net asset value of company *i*) were used. Chen, Jegadeesh and Wermers (2000) noted the following fund characteristics: A clear preference for large stocks; a preference for growth stocks; a preference to hold past winners; a preference for highly liquid shares which could be detrimental to returns as Datar, Naik and Radcliffe (1998) found that high turnover stocks earned lower returns than low turnover stocks; and large stocks were traded more frequently than small stocks. Chen, Jegadeesh and Wermers (2000) found that stocks which were most widely held by mutual funds did not outperform stocks that were least widely held on the basis of

annualised total returns. They also found that stocks recently purchased by mutual funds had significantly higher returns than stocks recently sold. The evidence suggests that stocks actively traded outperform stocks that are passively traded. Chen, Jegadeesh and Wermers (2000) also found that growth funds had better stock picking ability than income funds and that funds trading more frequently had better stock picking ability compared to funds that trade less frequently. Evidence of performance persistence was found and was explained by the momentum effect in stock returns.

It appears that there is a need to decompose the returns of actively managed funds to understand which activities add value and which activities destroy value. Beebower, Brinson, and Hood (1986) investigated the performance contribution of the activities that constitute the investment management process – market timing and security selection. A sample of 91 large corporate pension funds covering the period from 1974 to 1983 was used for testing, with assets under management of approximately $100m at the beginning of the period and $3bn at its end. Returns were decomposed in the following manner:



Wpi = policy (passive) weight for asset class i
Wai = actual weight for asset class i
Rpi = passive return for asset class i
Rai = active return for asset class i



Active Returns Due to:

Timing	II - I
Selection	III - I
Other	IV - III - II + I
Total	IV - I

Beebower, Brinson, and Hood, p.40

The investigation was performed on an asset class basis with asset classes defined as common stock, bonds, cash equivalents and other. On average, the funds were made up of 57.5% common stock, 21.4% bonds, 12.4% cash and 8.6% other. It was found that on average Timing returned -0.66%, Security

Selection -0.36% and Other -0.07% with a total underperformance of -1.10%. Returns were calculated using the mean average annualised total return. It is interesting to note the aggregate underperformance, although measured differently and over a different time period, is consistent with Jensen (1968). Beebower, Brinson, and Hood (1986) concluded that strategically altering the investment mix and selecting individual securities within an asset class (also known as investment strategy) should be addressed carefully and systematically by potential investors.

Beebower, Brinson, and Singer (1991) update the testing above on a selection of large corporate pension funds over the period 1977 to 1987. Timing is renamed Active Asset Allocation. On average the funds were made up of 53% equity, 24.5% bonds, 12.1% cash and 10.5% other. It was found that on average Asset Allocation returned -0.26%, Security Selection +0.26% and Other -0.07% with a total underperformance of -0.08%. It was also found that the average asset class weights were consistent over the time period. Beebower, Brinson, and Singer (1991) conclude that active management had no measurable impact on returns and also increased risk which is an unfavourable combination from a risk return trade-off.

Sharpe (1991) used an asset class factor model incorporating 12 asset classes to decompose mutual fund returns. These asset classes included Bills, Intermediate Governments, Long Governments, Corporate Bonds, Mortgages, Value Stocks, Growth Stocks, Medium Stocks, Small Stocks, Foreign Bonds, European Stocks and Japanese Stocks. Active returns were ultimately decomposed into style return (factor timing) and selection return (stock picking). The R^2 associated with the returns estimated by the 12 factor model was considered the percentage return driven by style return. The remainder (1 minus R^2) was considered the return due to selection return. Selection return was defined as,"...the difference between a fund's return and that of a passive mix with the same style." (Sharpe, 1991, p.20). The aggregate underperformance by 636 stock, bond and balanced funds from 1985 to 1989 was found to

be -0.89% per year. Sharpe (1991) concluded that the asset class model can provide one with an effective method to analyse the investment approach of fund managers.

Fox and Krige (2013) analysed the sources of performance in South African domestic equity unit trusts over the period 2002 to 2011. A similar methodology is used to that of Sharpe (1991). The sources of performance were divided into stock selection and sector allocation. To qualify for the sample a general equity fund had to have 10 years of monthly price data of which only 14 funds qualified. Due to the small size of the South African unit trust market as measured by assets under management and a relatively few number of funds operating in the market it is expected that South African studies will have small sample sizes when compared to international studies. Fox and Krige (2013) found that in the growth and general equity sample, funds were able to produce a positive alpha from sector allocation which was offset by a negative alpha from stock selection. The value of the entire sample's positive alpha from sector allocation was offset by a negative alpha from stock selection. Fox and Krige (2013 concluded that there is evidence that only top performing asset managers are able to obtain outperformance from stock selection and sector allocation, but not the average manager. Due to the small sample, statistical testing was not performed, but the trends were obvious.

Carhart (1997) introduced the four factor model to measure fund returns. The four factor model is a multi-factor model which is an extension of the classic capital asset pricing model which only incorporates the market risk premium as a variable. Fama and French (1992) introduced variables for small capitalisation and book to market ratio as inputs into the return estimation. Carhart (1997) builds on the three factor model by introducing a variable for one year momentum. Momentum was measured by subtracting the equal weighted average of the highest performing stocks from the same as the lowest performing stocks, lagged by one month.

Wermers (2003) investigated whether mutual fund shareholders are compensated for active management "bets" (deviations in the mutual fund holdings to that of its benchmark). The cross-sectional relation between returns and volatility in the U.S. mutual fund industry over the 1975 to 2000 period was examined. The sample begins with 205 equity funds and grows to 1,815 at the end of the period. Nine overlapping three year sub-periods are examined for the study. Wermers (2003) found that there is a positive relationship between the level of risk (as measured by tracking error) taken by a mutual fund and the performance of the fund. The fund's alpha was calculated as the difference in total annualised return of the fund and its benchmark index and was measured against the tracking error risk of the fund. The fund's alpha was also calculated using the Carhart (1997) four factor model. A regression was performed which showed a positive relationship between the two variables for the majority of sub-periods. Wermers (2003) used tracking error risk as a proxy for the degree of active "bets" and asserts that these bets resulted in higher returns. The regression performed indicated that taking on an additional one percent of standard deviation of return has on average resulted in an increase of 1.3% return. Wermers (2003) was found to be the seminal paper to investigate the correlation between fund returns and the degree of active bets taken by fund managers.

Kacperczyk, Sialm and Zheng (2005) investigated the deviation of mutual fund managers from the passive market portfolio by focusing on the concentration of the fund's holdings into different industries. Kacperczyk, Sialm and Zheng (2005) used mutual fund data across 1,771 funds covering the period from 1984 to 1999 and studied the relationship between industry concentration and performance which was measured by the four factor model of Carhart (1997). A divergence index was calculated to represent concentration which was calculated as the difference between the value weight of the holdings of the fund in a particular industry and the value weight of the market portfolio in that industry. The divergence Index can be thought of as a market-adjusted Herfindahl Index which is a measure of industry concentration. Mutual funds exhibiting an above median concentration produced

an average abnormal return of 0.33% per year net of expenses, whereas mutual funds with a below median concentration produced an average abnormal return of -0.77%. More concentrated mutual funds tend to outperform more diversified mutual funds. When investigating portfolio holdings the paper found that superior abnormal returns experienced by concentrated funds were due to superior stock picking ability. Concentrated funds tended to also have better style timing ability than diversified funds. The transactions of mutual funds were also investigated and it was found that stocks purchased by mutual funds tend to outperform stocks sold. The return difference also increased significantly with industry concentration. Kacperczyk, Sialm and Zheng (2005) concluded that, "industry concentration of a mutual fund, a specific measure of active management, is positively related to fund performance" (Kacperczyk, Sialm and Zheng, 2005, p.1).

Kacperczyk, Sialm and Zheng (2006) re-perform the testing above over the period 1984 to 2003 and found that the most concentrated fund portfolio generated abnormal return of 0.177% per month, while the most diversified fund portfolio generated an abnormal return of 0.015% per month. The evidence showed that only the most concentrated fund managers are able to earn a high risk adjusted return whereas low and medium concentrated funds earned similar returns and that there was no gradual increase in returns as would be expected from a traditional risk return trade-off. The evidence once again supported the value of active fund management and the stock picking ability of some mutual fund managers. Based on the findings by Kacperczyk, Sialm and Zheng (2006), investors seeking true active management are able to use the divergence index measure to identify the correct funds to invest in, and in doing so, can earn abnormal returns.

Cremers and Petajisto (2009) developed a measure which they claim to predict fund performance. The paper proposed a new approach to measuring Active Share and a new approach to establishing the type of active management implemented by mutual fund managers. Active management was described

as the magnitude of deviation from passive management. Active Share was calculated on a per share basis as the sum of the absolute differences between the weighting of a share in a portfolio and that of the same share in the particular funds benchmark. The total was then divided by 2 to arrive at a measure between 0% and 100%. Tracking error was also incorporated into the study which is the traditional measure of how much non-systematic risk a fund is willing to take on and is an estimate of how much the fund's holdings differ from its benchmark. A combination of these two measures allows one to categorise the type of active management implemented by the respective mutual fund. The two dimensional measure of tracking error and Active Share allows one to further refine the type of active management as well as identify closet indexing within the broader active category. Returns were measured as the annualised total return net of fees. Categorising active management in this way allows investors to identify funds which cater for their investment preferences and risk appetite.

Cremers and Petajisto (2009) found that active management predicts fund performance; the funds with the highest Active Share considerably outperformed their benchmark indices both before and after expenses, while the non-index funds exhibiting the lowest Active Share, underperformed. The highest level of Active Share outperformed the lowest level of Active Share by 2.81% per average per year using the four factor model to measure returns. Funds with the highest Active Share beat their benchmarks by 1.39% per average per year. The best performers were concentrated stock pickers followed by diversified stock pickers, which suggests that the two groups exhibit stock picking ability. The categories are arrived at given the combination of Active Share and tracking error exhibited by a group of mutual funds. Mutual funds exhibiting the highest levels of Active Share and the highest level of tracking error are categorised as concentrated stock pickers. Mutual funds exhibiting the highest levels of Active Share and low to moderate levels of tracking error are categorised as diversified stock pickers. The findings complement that of Kacperczyk, Sialm and Zheng (2005) as Cremers and Petasjito (2009) find that concentrated stock pickers exhibit the highest concentration index and closet indexers the lowest.

Cremers and Petajisto (2009) also found that more active funds had higher fees, whereas closet indexers charged lower fees. If fees are a proxy for the amount of effort exerted and skill offered by managers then the findings are intuitively correct. Fund size was found to be inversely correlated to Active Share and returns. As a funds increases in size its Active Share and alpha decrease substantially.

A funds' Active Share was found to be consistent over time, which means that a fund's current Active Share is a good predictor of the fund's Active Share in the following year. Funds with the highest Active Share tended to have higher expense ratios, whereas there is no correlation in low and medium Active Share funds. The most successful outperforming funds had high Active Share, high tracking error and low assets under management (below $1bn). From an investor's point of view, funds with the highest Active Share, smallest assets and best one year performance are very attractive, outperforming their benchmarks by 6.5% per average per year net of fees and expenses.

Petajisto's (2010) study is closely related to Cremers and Petajisto (2009) with more focus on the change in Active Share rating over time and evaluation over different market conditions. The study also covered a larger sample and longer time period as the period was extended by three years. Closet indexing was found to be increasing in popularity over the extended time period. Returns were calculated on a gross annualised total return basis as well as a net annualised total return basis. In line with previous studies (Jensen (1968)) weak performance was found across all actively managed funds with the average fund underperforming by 0.41% per year on average. The only group adding value to investors was found to be active stock pickers, which beat their benchmarks by 1.26% per year on average after fees and expenses. Before fees the stock pickers beat their passive benchmarks by 2.61% on average per year over the 1980 to 2009 period exhibiting a significant amount of skill.

Sun, Wang, and Zheng (2009) performed a similar investigation, but focused on periods of downturn in the market. The study also looked at active management, but from two different perspectives;

deviations from a passive benchmark and deviation from peer groups. The inclusion of deviation from peer groups is particularly useful in the context of the paper as it focuses on downturns in the economy. A downturn in the economy is a period when the unskilled manager would likely participate in herding as the likelihood of failure is high. In contrast to this a manager with real expertise would be able to perform well regardless of a recession and therefore will stand out from its peers. To quantify the deviation of a fund from its peer group the strategy distinctiveness measure was used. The study examined the correlation of individual fund returns with the average returns of peer funds within the same style, and used one minus the correlation to measure the degree to which a fund's returns differed from those of its peers. Returns were calculated using net annualised total returns, the Carhart (1997) four factor model and the Sharpe ratio. Using data across 2,856 funds covering the period from 1980 to 2008 Sun, Wang, and Zheng (2009) found that in down markets the most active funds outperformed the least active ones by 4.5% to 6.1% per year on average after adjusting for risk and expenses. On the other hand the most active funds did not outperform in the up markets. The analysis provides part of the answer to why active investment is attractive to investors as investors suffer from loss-aversion and are therefore willing to pay a premium to reduce downside risk.

Cohen, Polk, and Silli (2008) provide evidence that mutual fund managers can pick stocks which outperform the market. The study attempted to disprove the assertion that markets are efficient due to the inability for mutual fund managers to outperform benchmarks. The study focused on the "best ideas" of portfolio managers by filtering out potentially alpha neutral positions in fund portfolios. Returns were calculated using net annualised total returns, the Carhart (1997) four factor model and a newly introduced six factor model with additional variables. The following reasons were given as to why examining total performance may be misleading way to measure stock-picking skills; manager compensation is often linked to the size of the fund's holdings and as alpha generating ideas run out the manager continues to invest in non-alpha generating shares; managers are encouraged to diversify in

order to reduce volatility; and fund managers are found to trade off liquidity against valuation motives. Cohen, Polk, and Silli (2008) covered the period 1990 to 2005.

Cohen, Polk, and Silli (2008) found that stocks, which active managers displayed the most conviction towards, outperformed the market, as well as all other stocks within the manager's portfolio, by approximately 39 basis points to 127 basis points. The study found that "the U.S. stock market does not appear to be efficiently priced since the typical active mutual fund manager is able to identify stocks that outperform the market" (Cohen, Polk and Silli, 2008, p.1). Cohen, Polk, and Silli (2008) conclude that factors relating to the organisation of the money management industry induce managers to pick stocks which are not outperformers even though they are able to pick outperforming stocks. There seems to be an "institutional imperative" at work in the money management industry which destroys value. Cohen, Polk, and Silli (2008) found that more than 70% of best ideas did not overlap between managers and that the majority of abnormal returns came from best ideas that were least shared between managers. "Consequently, a managerial stock pick performs if it is best, fresh and first." (Cohen, Polk, and Silli, 2008, p.13)

Amihud and Goyenko (2013) contributed to the studies relating to active management and the predictive nature thereof. A fund's R^2 was proposed as a simple measure of the activeness of a mutual fund. R^2 is commonly known as the percentage of a fund or security's movements that can be explained by movements in a benchmark. A low R^2 means that the fund tracks the benchmark less closely. Alpha is calculated using the capital asset pricing model. Amihud and Goyenko (2013) found that a lower R^2 is a significant predictor, with a negative coefficient of fund alpha and also identified an R^2 based strategy that earned a significant positive risk adjusted return.

The studies above, (Wermers (2003), Kacperczyk, Sialm and Zheng (2005), Cremers and Petajisto (2009), Petajisto's (2010), Sun, Wang, and Zheng (2009), Cohen, Polk, and Silli (2008), Amihud and

Goyenko (2013)) , amongst other things, identified the sub-set (type and degree) of active management within the broader active management category and show how certain investment strategies have provided abnormal returns over particular time periods.

2.2. Measurement of Return

A variety of return measures were used to estimate the alpha produced by the respective mutual funds in the above literature. The simplest method is the total annualised return above or below the respective funds benchmark which is easy to calculate, easy to understand and widely used in the fund industry when evaluating fund performance. The Sharpe Ratio has also been used which caters for the risk that a fund exhibits; the net annualised total excess return (return in excess of the risk free rate) is considered against the volatility of the fund measured by its standard deviation. The measure provides an investor with a risk-adjusted measure of return which is helpful for investors who want to ensure that the return they achieve over the risk free rate is commensurate with the risk that was taken (a pension fund would be a good example).

The Capital Asset Pricing Model ("CAPM") was also used to calculate the fund's estimated abnormal risk adjusted return (alpha). The basic model, incorporating one variable, being the excess return of the fund compared to the market, was extended up to six variables as research has evolved and measures have improved. Jensens alpha (Jensen, 1967), Fama and French (1992) three factor model, Carhart (1997) four factor model and Cohen, Polk, and Silli (2008) six factor model were used in various studies to measure a fund's performance. The alpha calculated using the CAPM is an estimate of the difference in actual return compared to the theoretical risk adjusted return of a security. Fama and French (1992) found that the traditional measure (Jensen's alpha) did not adequately explain the small capitalisation and value effect and therefore one had to specifically control for these variables by incorporating them into their three factor model. Carhart (1997) found that there was a momentum effect when analysing

the returns of mutual funds and therefore specifically controls for this effect by incorporating a momentum measure into the Carhart (1997) four factor model. Carhart (1997) found it to be a more precise measure when compared to the other multi-factor models. A six factor model was later introduced which incorporates factors specifically relating to the type of testing performed by Cohen, Polk, and Silli (2008).

2.3. Measurement of Activeness

The measure of a fund's deviation from its benchmark or activeness has been approached in a variety of ways. A traditional measure used by the fund community is tracking error. Tracking error is calculated as the standard deviation of the difference between the funds return and the return of its benchmark. A low tracking error would suggest that the fund's holdings are very similar to its benchmark and a high tracking error would suggest that the fund's holdings are very different to that of its benchmark. For example, one would expect a very low tracking error to be exhibited by an index fund, whereas one would expect a very high tracking error to be exhibited by a fund with very few shares and a focused mandate. The tracking error is however increased in times of high market volatility even though a fund's holdings may not have deviated more or less from the benchmark making the measure deficient and hard to interpret over time. The measure is not absolute and must rather be measured in relation to other funds at a particular point in time.

Beebower, Brinson, and Hood (1986) were able to decompose returns into different categories which allows one to identify the policies adopted by fund managers. Kacperczyk, Sialm and Zheng (2005) used an industry approach to identify how a fund's holdings diverge from that of their benchmark. A divergence index was calculated by comparing the weight of a sector in a fund to the weight of the same sector in its benchmark.

Deviation from peer groups was also used to identify how active a fund is in relation to its peers. The measure was calculated by Sun, Wang, and Zheng (2009) by measuring the correlation between the returns of a fund and its peers. Amihud and Goyenko (2013) used A fund's R^2 to measure the activeness of a fund.

Cremers and Petajisto (2009) developed a measure known as Active Share whereby the percentage holding in an individual stock is compared to the percentage holding of the same stock in the funds benchmark index. The calculation was preformed across the universe of stocks available to the fund. A rating was given to the fund which indicates by what degree the fund's holding differ to that of its benchmark. The measure is particularly useful in identifying "closet indexers" which are fund managers that replicate the index while charging a management fee. One of the benefits of the measure is that it is absolute and unaffected by volatility. Tracking error was not disregarded by the study and instead tracking error was incorporated with Active Share to group funds into different categories or fund styles.

2.4. Labelling and Sample Size

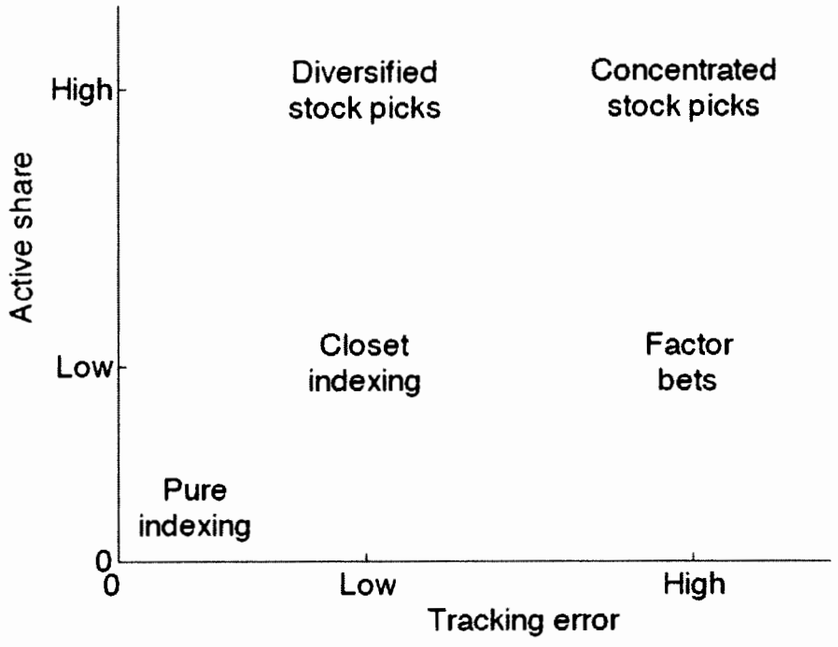
The labelling of these styles and the boundaries used to establish them has differed as there are no clear cut boundaries. There is positive correlation between Active Share and tracking error (the two measures used to complete the labelling exercise), yet there is still considerable variation. A tracking error of between 4 – 6% can be associated with an Active Share of between 30 – 40% and an Active Share of between 70 – 80% can be associated with a tracking error between 4 – 16% (Cremers and Petajisto (2008), 14).

An active equity fund manager produces a positive alpha (excess returns) by implementing two approaches: stock selection and/or factor timing. Stock selection involves selecting shares which the manager expects to outperform other available shares. Factor timing involves making bets on systematic or market risk factors such as industry, market, or any systematic risk factor relative to the benchmark.

These distinct approaches contribute differently to tracking error and in either case can result in a high alpha.

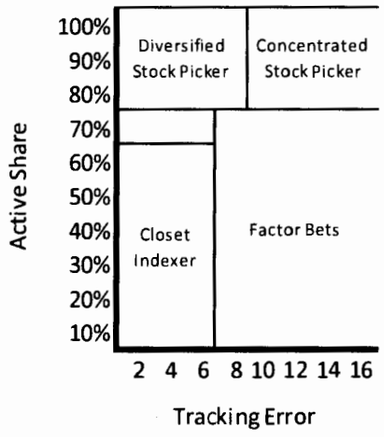
For example a fund may be very selective and concentrated stock picker *within* industries but also aim to be well diversified *across* industries whereas a "sector rotator" would be very concentrated in certain industries, but well diversified within those industries. The tracking error of the sector rotator is substantially higher than that of the diversified stock picker suggesting it is more active. The diversified stock picker's tracking error is lower merely because there are far more shares to select in the entire economy making it naturally better diversified than a sector rotator.

Cremers and Petajisto (2009) divided funds into four categories; Closet Indexers, Factor Bets, Diversified Stock Pickers and Concentrated Stock Pickers:



Cremers and Petajisto 2009, p.52

Cut-offs are used to differentiate between groups – concentrated stock picker: Tracking error greater than 8% and Active Share greater than 80%; diversified stock picker: Tracking error less than 8% and Active Share greater than 80%; factor bets: Tracking error greater than 6% and Active Share below 80%; closet Indexer: Tracking error less than 6% and Active Share less than 60%. An index fund which is excluded from the any of the above groups, must have an Active Share less than 20%. A sample of 2,650 funds are tested covering the period from 1980 to 2003 with 48,373 observations. The diagram below represents the labeling cut-offs used:



Petajisto (2010) categorises the type of management in line with the table below:

Active Share quintile	Tracking error quintile				
	Low	2	3	4	High
High	5	5	5	5	4
4	2	2	2	2	3
3	2	2	2	2	3
2	2	2	2	2	3
Low	1	1	1	1	3

Group	Label
5	Stock pickers
4	Concentrated
3	Factor bets
2	Moderately active
1	Closet indexers

Petajisto 2010, p.62

Petajisto (2010) selected 2,740 funds covering the period from 1980 to 2009 making up 81,158 observations. Closet indexers were again labelled as having an Active Share less than 60%. Due to the large number of funds the study was able to be very selective when labelling the concentrated stock pickers.

For both Cremers and Petajisto (2009) and Petajisto (2010) funds were sorted into groups on a monthly basis based on the closing Active Share and the tracking error of the funds over the trailing 6 months. Each group's monthly return was recorded and the time-series average calculated.

2.5. *Trends in Active Share*

Cremers and Petajisto (2009) provided commentary relating to the trend of Active Share from the 1980's to 2003. Cremers and Petajisto (2009) noted that the proportion of passive funds which claim to be active has been increasing. In the 1980's the proportion of funds with low Active Share (20 – 60%) was negligible whereas in 2003 that percentage was approximately 30%. Average Active Share has decreased from 80% to 60% over the time period.

Petajiso (2010) updated Cremers and Petajisto (2009) up to 2009. Closet Indexing (Active Share 20 – 60%) was found to increase from 1999, peak in 2002, decline in 2006 and then increase from late 2007 till 2009. Petajisto (2010) found that Active Share was inversely correlated to volatility over time. Petajisto's (2010) hypothesis is that high volatility amplifies differences in performance between the fund and its benchmark and that underperformance is particularly painful in down markets, which encourages managers to be less active.

2.6. *Benchmark Selection*

Instead of selecting the benchmark indicated by the fund, Cremers and Petajisto (2009) estimated the most appropriate benchmark by selecting the benchmark which provided the lowest Active Share for the fund. The index selected therefore has the greatest amount of overlap with the respective fund. They thus choose the index which has the most overlap with the holdings of the respective fund.

Petajisto (2010) used the reported benchmark in his research instead of the benchmark which provides the lowest Active Share.

2.7. *Fund Performance*

Cremers and Petajisto (2009) found the difference in performance between high Active Share funds and low Active Share funds to be 2.81% on a net annualised basis and 3.26% using the Carhart four

factor model. Closet indexers and factor bets were found to display a negative alpha whereas concentrated stock pickers and diversified stock pickers displayed a positive alpha.

Petajisto (2010) found that the average fund underperformed its benchmark by approximately -0.41%. Underperformance was experienced by moderately active funds (-0.52%), factor bets (-1.28%) and closet indexers (-0.91%). The only group that generated an alpha was active stock pickers which beat the benchmark by 1.26% using annualised net returns and 1.39% using the Carhart four factor model. The stock pickers also outperformed the closet indexers net of fees by an amount of 2.17%, which was statistically significant.

Petajisto (2010) also provided an analysis of performance over the financial crisis (the period from May 2008 to December 2008). During the financial crisis annualised underperformance was experienced by closet indexers (-0.83%), moderately active funds (-0.32%) and factor bets (-1.72%) whereas stock pickers continued to outperform at 0.97%. Stock pickers produced outstanding results during the 2009 recovery exhibiting an annualised alpha of 6.09% compared to the average fund beating its benchmark by 2.13%.

The first study to investigate Active Share in South Africa was performed by Muller and Ward (2011). A sample of 90 unit trusts was selected between June 2006 and September 2010. A hybrid measure was used which is incorrectly titled "Active Share". Instead of using percentage holdings of stocks as the weightings, the measure uses percentage holdings of a particular sector. The measure would be better described as an industry concentration ratio or degree of industry concentration in relation to the benchmark and, in isolation, is not suitable to describe the degree of activeness of a unit trust fund. As noted earlier one would have to consider how diversified the fund is within industries to gauge the activeness of the fund. The paper found that "Active Share" (as defined by Muller and Ward (2011)) has decreased from a high of 50.5% in 1989 to 13.8% in 2010. The 5 year average "Active Share" from

September 2006 to September 2010 was calculated at 45%. The study found no relationship between the level of "Active Share" and a fund's 5 year return. The finding was compared to that of Cremers and Petajisto (2009) who found a significant relationship, but the comparison is incorrect as different measures have been used in the two papers. The paper found that as "Active Share" increases, so the spread of returns increases. The finding raises doubts about the ability of fund managers to pick stocks which outperform.

2.8. Why Is This Study Relevant To South Africa?

Cremers, Ferreira, Matos and Starks (2013) investigated the effect of explicit indexing in various geographic regions on the level of active management and fees. The study used a data set of open-ended equity mutual funds and exchange traded funds in more than 30 countries covering the period from 2002 to 2010 in which South Africa is included. In the United States the share of index funds and ETFs making up the entire market grew from 16% of assets under management in 2002 to 27% in 2010. In all other regions the industry grew at a faster rate, although off a lower base, from 6% to 13% over the same time period. The popularity of passive investments is clearly subdued in markets outside of the United States.

Cremers, Ferreira, Matos and Starks (2013) found that outside of the United States approximately 30% of assets are managed by closet indexers, which is approximately double the closet indexing level demonstrated in the United States. Competition from index funds is specifically investigated and was found to influence active funds in several ways. Firstly, actively managed funds tended to have higher levels of Active Share in countries exhibiting a higher proportion of explicit indexing. Indexing appeared to discipline active fund managers to pursue active management. Secondly, a higher portion of index funds correlated with lower fees charged by active managers. Active funds were found to charge higher fees in countries with a larger degree of closet indexing. The findings suggest that explicit indexing leads

to competitiveness. Thirdly, that Active Share predicts fund performance and specifically that a ,"...one standard deviation increase in Active Share is associated with an increase of about 1% per year in future benchmark adjusted returns..." (Cremers, Ferreira, Matos and Starks, 2013, p.4). Finally, there is also evidence that returns from active management are higher in geographic regions where index funds are prolific. The contention is that only skilled managers will survive in highly competitive environments.

Fund size was found to be inversely related to performance and Active Share. Within the South African general equity market there are two funds managers which represent approximately 24% of the market as at end September 2013. The remainder of the market is also highly concentrated. Hypothetically, a market with five large funds would be less active than a market with 100 smaller funds. If fund manager concentration in the South African market is as high as it appears to be, then it follows that the expected levels of active management will be low

Given the relatively low activity of explicit indexing in the South African market (approximately 5.2% of all equity unit trusts as at 2013/06/30 based on ASISA statistics) and taking into consideration the findings above, South Africa is a prime candidate for high levels of closet indexing and charging above average fees. A more in-depth investigation is therefore highly beneficial to South African unit trust market participants.

3. Research Question

Firstly, this study aims to investigate and analyse trends in Active Share and tracking error of the general equity unit trust industry over the period under review (30/06/2006 to 30/06/2013). Also, Active Share is compared against returns on the JSE ALSI and movements in market volatility to determine whether or not market deviations and volatility have a bearing on Active Share. A macro-styled graphical analysis will be performed over the entire period under review and under carefully selected sub-periods to establish the effect of bull and bear markets on Active Share. A Wilcoxon signed rank test is used to establish whether the average Active Share of the sample at the beginning of the period differs from the average Active Share of the sample at the end of the period. Parametic tests were utilised in this study, unless the underlying data was not normally distributed in which case non-parametic tests were utilised. A significance level of 10% has been selected for all tests of significance within this study. The following null and alternative hypothesis is applicable:

$H_0: \mu_0 = \mu_1$

$H_a: \mu_0 > \mu_1$

where μ_0 is the population mean at the beginning of the period and μ_1 is the population mean at the end of the period.

Secondly, an investigation into what factors motivate managers to change their level of Active share is examined. In other words, this research paper attempts to establish what factors drive changes in Active Share. A funds flow analysis and risk of underperformance measure is developed.

Thirdly, the study aims to ascertain which particular active management style, if any, has been able to produce an alpha over the period under review. Management style relates to the combination of Active Share and tracking error displayed by the fund and is explained in more detail under section *5.4*

Labelling of styles. In doing so one can test which style of active management has been successful and whether unit trust investors are rewarded for taking on additional risk. T-testing is performed to test which style has outperformed the most over the entire period. The following null and alternative hypothesis is applicable:[3]

$H_0: \mu_i = 0$

$H_a: \mu_i > 0$

where μ_i is the sample annualised mean return over the review period for style i.

It is expected that funds within the concentrated stock picker category to be statistically significant and the funds within in the closet indexer category to not be statistically significant. It is therefore expected for the p-value obtained from the t-test to be lower and below 10% for the concentrated stock picker and higher and above 10% for closet indexer.

It is also expected that funds falling into the closet indexer category exhibit the lowest alpha and that funds within the concentrated stock picker category exhibit the highest alpha. The reason for the expectation is due to the assumed risk/return trade-off. It is therefore expected for the p-value obtained from the t-test to be the lowest for closet indexer and the highest for concentrated stock picker.

It is also expected for the mean alpha relating to concentrated stock pickers to be statistically greater than that of closet indexer. T-testing is performed with the following null and alternative hypothesis:

$H_0: \mu_{concentrated\ stock\ picker} = \mu_{closet\ indexer}$

[3] The size of the datasets used for certain statistical tests performed in this study reduces the robustness of the relevant statistical testing.

$H_a: \mu_{concentrated\ stock\ picker} > \mu_{closet\ indexer}$

Fourthly, the testing above is performed over different time periods to ascertain which styles fare better or worse in bull markets (30/06/2006 to 31/05/2008), the financial crisis (01/06/2008 to 31/12/2008), the subsequent bull run to previous pre-financial-crisis levels 01/01/2009 to 31/01/2012) and the push through past such levels (01/02/2012 to 30/06/2013). Each of these time periods exert different pressures on unit trust managers. As noted by Sun, Wang and Zhen (2009), managers are more likely to closet index during bear markets whereas in bull markets managers are likely to be more active. During bull markets surging past pre-financial-crisis levels, managers are expected to be more cautious as there is more uncertainty in the market. The testing is performed using a revised 2 by 2 matrix owing to the limited observations within certain categories given the low number of observations over certain time periods. The 2 by 2 matrix minimises the risk that an unreliable result could be obtained due to a minimal number of observations in certain categories. T-testing is performed to test which style has outperformed the most over the various sub-periods. The following null and alternative hypothesis is applicable:

$H_0: \mu_{i,j} = 0$

$H_a: \mu_{i,j} > 0$

where $\mu_{i,j}$ is the sample mean annualised return for style i in sub-period j.

It is expected for concentrated stock pickers to outperform closet indexers substantially during the financial crisis in line with prior studies' findings, and in periods of bull runs it is also expected for concentrated stock pickers to outperform closet indexers. It is therefore expected for the p-value obtained from the t-test to be lower for concentrated stock picker compared to closet indexer.

Fifthly, an investigation has been performed into Total Expense Ratios (TER) charged by unit trusts. Adjusted TER's are calculated to ascertain a more meaningful estimate of expenses when considering the extent of active management undertaken by unit trust managers.

It is expected that revised TER's are much higher than actual TER's. It is expected that a much lower average TER to be exhibited by the sample of synthesised unit trusts compared to the actual average of the sample.

It is expected that TERs and Adjusted TERs are positively correlated to Active Share and tracking error. Intuitively, the more active a fund, the higher the (active) management fees should be.

Sixthly, testing is performed whether Active Share level 5 exhibits a higher alpha than Active Share level 1. T-testing is performed with the following null and alternative hypothesis is applicable:

$H_0: \mu_5 = \mu_1$

$H_a: \mu_5 > \mu_1$

where μ_5 is the sample mean annualised return over the review period for level 5 and μ_1 is the sample mean annualised return over the review period for level 1.

Seventhly, testing is performed whether tracking error level 5 exhibits a higher alpha than tracking error level 1. T-testing is performed with the following null and alternative hypothesis is applicable:

$H_0: \mu_5 = \mu_1$

$H_a: \mu_5 > \mu_1$

where μ_5 is the sample mean for level 5 and μ_1 is the sample mean for level 1.

4. Measuring Active Management of Unit Trusts

An active manager can only add value for his unit holders if he deviates from his benchmark as all investors have the option of earning a market return by investing in an index fund. Active managers deviate from their benchmark by stock selection or factor timing. Stock selection is a bottom-up process of selecting the most attractively priced shares in the market. Factor timing is a top-down macro approach focusing on broader macro categories such as industries, type of shares or type of assets in order to determine the most attractively priced shares.

Passive management is defined as,"...replicating the return on an index with a strategy of buying and holding all (or almost all) index stocks in the official index proportions" (Cremers and Petajisto, 2009).

Active management is defined as, "...any deviation from passive management" (Cremers and Petajisto, 2009). Measuring the degree of active management is therefore measuring the degree of deviation from passive management.

4.1. Tracking Error

Tracking error is a measure used widely in the unit trust community to measure the degree to which a fund deviates from its benchmark. It is commonly calculated as the difference in returns between a unit trust ($Rfund, t$) and it's benchmark ($Rindex, t$) or as the standard deviation of the difference in returns between a unit trust and it's benchmark which is more appropriately termed tracking error volatility. Tracking error volatility is used throughout this study as shown in the following formula:

$$Tracking\ Error = Stdev\ [R_{fund,t} - R_{index,t}]$$

Tracking error measures the volatility of a fund which cannot be attributed to its benchmark index (a proxy for the market). Tracking error is generally calculated on a daily or monthly basis and annualised accordingly.

4.2. Active Share

The measure developed by Cremers and Petajisto (2009) is a simple, but time-consuming method to compare the holdings of a fund ($Wfund, i$) to that of its benchmark ($Windex, i$). The weights of all assets available to the respective funds across the universe are compared (across the universe of all assets available) to the respective funds:

$$Active\ Share = \frac{1}{2}\sum_{i=1}^{N}|W_{fund,i} - W_{index,i}|$$

Active Share incorporates absolute differences in portfolio weights for all shares between a fund and its respective benchmark index. The measure indicates where the fund is under- or overweight in a particular share.

"We can decompose a mutual fund portfolio into a 100% position in the benchmark index, plus a zero net investment long-short portfolio. The long-short portfolio represents all the active bets the fund has taken. Active Share then measures the size of that long-short position as a fraction of the total portfolio of the fund. We divide the sum of portfolio weight differences by 2 so that a fund that has a zero overlap with its benchmark index gets a 100% Active Share" (Cremers and Petajisto, 2009). A unit trust that is long only will always have an Active Share between 0% and 100%.

Using a simplistic example, if the shares in the benchmark are equally weighted, then a fund that invests in 20 out of 100 shares making up the investable universe will have an Active Share of 80%. In the same way a fund that invests in 200 of the 1000 available shares will have an Active Share of 80%.

That tracking error is a commonly used and accepted measure of deviation from a benchmark begs an examination of why it is necessary to combine two measures (one of which is particularly time consuming to calculate and may not be adopted by the unit trust community) to evaluate active

management. It has been found that tracking error understates the active management of diversified stock pickers (Cremers and Petajisto, 2009). Consider the two ways in which managers can produce an alpha: stock selection and factor timing. When the manager is undertaking factor timing he is taking large bets on large aggregate positions. As a result of the tactical asset allocation, the manager is taking on a large amount of systematic risk. A stock picker can however be very selective within industries exhibiting high active management, but well diversified across industries resulting in low systematic risk as measured by tracking error. For example, assume that there are 20 stocks in 50 industries available to a manager. If that manager selects 1 stock in each (and every) industry, the fund has a high Active Share of approximately 95%, but a very low tracking error as most of the risk in its active positions is diversified away.

"Hence, Active Share and tracking error emphasise different aspects of active management. Active Share is a reasonable proxy for stock selection, whereas tracking error is a proxy for systematic factor risk. To get a complete picture of active management we need both measures" (Petajisto, 2010).

4.3. Determining the Threshold for Closet Indexing

In unit trust investing clients pay managers' fees to provide an alpha. Alternatively, investors can invest with an index tracking fund that does not charge management fees. The index tracking fund charges minimal administration fees and as a result provides a return close to that of the market return. Closet indexing is the practice of "actively" managed funds that so closely mimic the benchmark they are mandated to beat but still charge management fees. A closet indexer benefits from never significantly underperforming the benchmark and hence not having funds withdrawn owing to underperformance. The exact numerical cut-off to use when labelling a fund as a closet indexer is hard to establish, but Active Share provides one with a useful measure and guide.

"By definition, about 50% of the value of the index experiences above-average returns and about 50% experience below average returns relative to the index itself. Hence, regardless of the beliefs of the manager, he cannot possibly believe that over 50% of the index will beat the index. If a manager holds more than 50% of the index (i.e. has an Active Share less than 50%), then some of the positions cannot be there because the manager expects them to outperform the index; they exist only because he wants to reduce his risk relative to the index, even when it means including negative-alpha stocks in the portfolio. This is of course the opposite of what investors are paying active managers to do, since investors can always buy a cheap index fund if they want to reduce volatility relative to an index. Hence an Active Share of 50% is the theoretical minimum that an active manager could possibly have. As in Cremers and Petajisto (2009) I set my closet indexer cut-off at an Active Share of 60%" (Petajisto, 2010).

As shown by the excerpt above, previous studies have provided a cut-off of 60% to identify closet indexing.

A fund with a low Active Share is not necessarily an undesirable option for an investor. Investors have varying willingness and abilities to take on risk and a low Active Share unit trust is less risky than a high Active Share unit trust in relation to alpha. An issue arises owing to the alternatives available to retail investors that provide investors with the same level of risk and return. Modern portfolio theory asserts that an investor will hold portfolios of riskless and risky assets along the minimum variance frontier in a weighting dependent on their risk preference. In the same way an investor can hold a passive investment (index fund) in combination with an active investment (truly active unit trust) and be exposed to the same amount of risk, as measured by Active Share, compared to investing in a low Active Share unit trust. In doing so an investor would be paying administration fees on the portion invested in the index fund and management fees for the portion invested in the active unit trust. To illustrate, assume an investor with a preferred 75/25 split between active management and passive management,

charges administration fees of 0.50% and management fees of 2%. The investor will pay total fees of 0.875%. A closet indexer on the other hand charges management fees of 2% on the entire holding, resulting in a fee differential of 1.125%. Although the difference appears minimal, the effect of compounding the difference over a long period can be astounding and extremely detrimental to an investor. Another method of demonstrating the effect is to consider a fund with a 50% Active Share and management fees of 2% per year. When considering that only 50% of the holdings are invested actively, it means that fund level expenses amount to 4% as a fraction of active positions of the fund. "Since only the active positions of the fund can possibly outperform the benchmark it is very hard for a closet indexer to overcome such fees and beat its index net of expenses" (Petajisto, 2010).

5. Empirical Methodology

5.1. Overview

Below is an overview of the methodology:

1. At each quarter, each unit trusts Active Share and tracking error was calculated.
2. At each quarter, unit trusts were divided into terciles based on Active Share and divided into terciles based on tracking error.
3. At each quarter, unit trusts were categorised into styles based on the given combination of Active Share tercile and tracking error tercile associated with the unit trust. In total 9 styles were identified (refer to *5.4 Labelling of Styles*).
4. At each quarter, each unit trusts three month annualised alpha was calculated.
5. Below is an example of the manner in which the average alpha per style was calculated:
   In quarter 1, the individual three month annualised alphas associated with all unit trusts in the "Closet indexer" style were documented. In quarter 2, the individual three month annualised alphas associated with all unit trusts in the "Closet indexer" style were documented and added to the list of items from quarter 1. The exercised was repeated until the final quarter. Through this process all the alphas over the review period relating to the "Closet indexer" style were collated and documented. The simple average of all these items was calculated to arrive at the average annualised alpha relating to "Closet indexer" consistent with Cremers and Petajisto (2009). The process was repeated for all styles.

5.2. Data

A variety of datasets are required for the study. To compute Active Share one requires the constituents of the benchmark indices as well as the holdings of the unit trust portfolios at varying points in time over the period under review. Both of these sets of data are considered highly sensitive.

The sensitivity coupled with the general lack of readily available financial market data in South Africa increases the difficulty of obtaining such data on a broad range of funds. Benchmark index constituent data was obtained directly from the JSE on a quarterly basis from 2006/06/30 till 2013/06/30. Although each fund in the sample has a single benchmark, the benchmarks used by the individual funds differ. These were: FTSE/JSE Top 40 (J200), FTSE/JSE All Share (J203) and FTSE/JSE Shareholder Weighted All Share (J403).

The FTSE/JSE Top 40 (J200) Index consists of the 40 largest companies by full market value in the FTSE/JSE All-Share Index. The FTSE/JSE All-Share (J203) Index consists of 99% of the full market capital value of all ordinary securities listed on the main board of the JSE, subject to minimum free-float and liquidity criteria. The FTSE/JSE Shareholder Weighted All Share (J403) has the same constituents as the FTSE/JSE All Share (J203), however the weightings are calculated using only the portion of listed share capital that is registered on the South African share register (foreign held shares are excluded and only locally held shares are reflected). Unit trust quarterly holdings data was purchased from Profile Data over the same time period as the index constituent data.

Data relating to each unit trust fund and each index is required to compute tracking error. Daily net asset value prices were obtained for each fund and daily closing prices were obtained for each index. Both data sets were obtained from I-Net Bridge. Return on a unit trust has been calculated using the closing and opening net asset value price and return on the index has been calculated using the closing and opening index value. Closing values of the SA volatility index (SAVI) have been obtained from I-Net Bridge.

5.3. Sample Selection

The population of local general equity unit trust funds as at 30 June 2013 was obtained from the ASISA website. The South African local equity unit trust market is dominated by a handful of large unit trusts. Owing to the large concentration of unit trusts (relatively few unit trusts dominating the market) and time consuming process of calculating Active Share, a screening method was used for selection purposes.

Using the domestic equity general category as the population, the following filters were applied:

1. Funds with assets under management below R1.5bn were excluded (the effect of funds smaller than R1.5bn (in an aggregate industry of R228 billion as at 2013/06/30) is unlikely to have an impact on the results));
2. All Index funds were excluded (as they purposefully strive for a low Active Share);
3. All institutional funds (funds which are not available to retail investors) were excluded (as the holdings data is not publicly available); and
4. All funds that do not have a mandate to produce an alpha in relation to an index benchmark were excluded (such as high dividend yield funds).

A sample of 23 funds was selected for testing. The sample represents approximately 85.4% of the revised assets under management at 2013/06/30 when excluding items relating to 2, 3 and 4, leaving a retail, non-index and non-income fund population. The sample represents approximately 62.5% of the assets under management at 2013/06/30 when only excluding item 2 and 4. The sample represents approximately 58.2% of the assets under management at 2013/06/30 of the entire South African local equity unit trust population (when making no exclusions). Although a small sample has been selected, the funds make up a large portion of the unit trust market and are tested on a quarterly basis over a seven year period resulting in 638 data points.

A small portion of funds do not disclose individual share holdings which make up less than 1% of the fund, and instead disclose the aggregate of these small holdings in a particular sector (e.g. "holdings less than 1% - Resources"). Such holdings have been considered Active holdings and were added to the Active Share measure.

A small number of funds did not disclose their holdings for a portion of the period under review. The Active Share of these funds is assumed to the same as the previous period for calculation purposes. Cremers and Petajisto (2009) find that a fund's Active Share is consistent over time, which means that a fund's current Active Share is a good predictor of the fund's Active Share in the following year.

Tracking error is calculated on a daily basis over a six month rolling period at each quarter. Six months was deemed the minimal time period for the calculation to ensure a reliable figure in line with Cremers and Petajisto (2009).

At each quarter returns have been calculated as the total return net of fees over the following three month period. In doing so the study aims to test the predictive nature of the measures and methodology. Alpha was calculated as the difference between the following three month return of the fund and the following three month return of the respective benchmark. One must note that two funds which have shown the same absolute return could have a different alpha depending on the benchmark used.

The alpha for each style is calculated as the total simple average of each alpha observation in the style over the period under review, consistent with Cremers and Petajisto (2009). The number of observations in each style varies due to the grouping mechanism used.

5.4. Labelling of Styles

In previous studies investigating Active Share and performance much larger sample sizes have been selected compared to this study. Cremers and Petajisto (2009) use a sample size of 2,650 funds and Petajisto (2010) a sample of 2,740 funds. As a result of the large samples used the studies were able to use a 5 by 5 matrix to categorise the style of management. In Cremers and Petajisto (2009) and Petajisto (2010) only one of the 25 resulting classifications arising from a 5 by 5 matrix is applicable to concentrated stock pickers. The studies were also able to employ an Active Share cut-off of 60% to differentiate between active funds and closet indexers. When applying the same cut-off in this industry, only approximately a third of the 23 funds in this study's sample would be categorised as actively managed and tested. Hence the technique applied in this study was revised and no cut-off used. Previous studies have either used specific cut-offs relating to Active Share and Tracking Error to establish the style of active management, or allocated blocks on the 5 by 5 matrix to types of Active management. Using a similar methodology as Cremers and Petajisto (2009) and Petajisto (2010), this study risks certain styles having no or minimal observations due to the limited size of the sample. Unreliable results and conclusions could be derived as a consequence. The grouping mechanism had to be altered into a simplistic 3 by 3 matrix using terciles of Active Share and tracking error. At each quarter funds are ranked based on Active Share and Tracking Error and split into three groups for each measure. Funds were then labelled 11, 12, 13, 21, 22, 23, 31, 32, 33 and the mean alpha was calculated for each group.

The following labelling has been used to differentiate between active management styles:

Active Share \ Tracking Error			
	13 Diversified Stock Picker	23 Aggressive Stock Picker	33 Concentrated Stock Picker
	12 Moderately Active Diversifier	22 Moderately Active	32 Aggressive Sector Bets
	11 Closet Indexer	21 Active Sector Bets	31 Sector Rotator

5.4.1. Closet Indexer (11)

Closet indexer is the combination of the lowest tracking error and lowest Active Share. Note that in this research paper the closet indexer is not labelled according to funds falling below the Active Share level of 60%. Funds falling into this group take low sector bets and are not selective within any industry. These funds are the least active out of any style.

5.4.2. Concentrated Stock picker (33)

Concentrated stock picker is the combination of the highest tracking error and the highest Active Share. This group consists of managers that take strong sector bets and are selective within the relevant sectors or industries. The group also consists of managers that invest large amounts of capital in a few shares and focus little on sector preferences or top down analysis. This group forms the highest level of active management available to investors.

5.4.3. Sector Rotator (31)

Managers that take large sector bets and take on more non-systematic risk (as demonstrated by a high tracking error), but that are well diversified within sectors (as demonstrated by low Active Share), are labelled sector rotators.

5.4.4. Diversified Stock Picker (13)

Funds falling into the diversified stock picker group take low sector bets, but are highly selective within all sectors. The funds making up this category would intend on being well diversified across sectors, but selective within sectors.

5.4.5. Moderately Active (22)

Unit trusts that take moderate sector bets and are moderately selective are labelled moderately active. These unit trusts exhibit neither high nor low conviction towards sector bets and stock picking.

5.4.6. Other (12, 21, 23 and 32)

The other groups can be viewed as intermediate styles incorporating the relevant portion of the styles that represent the corner of middle style categories.

6. *Overview of results*

The results of each of the tests performed is summarised in the table below:

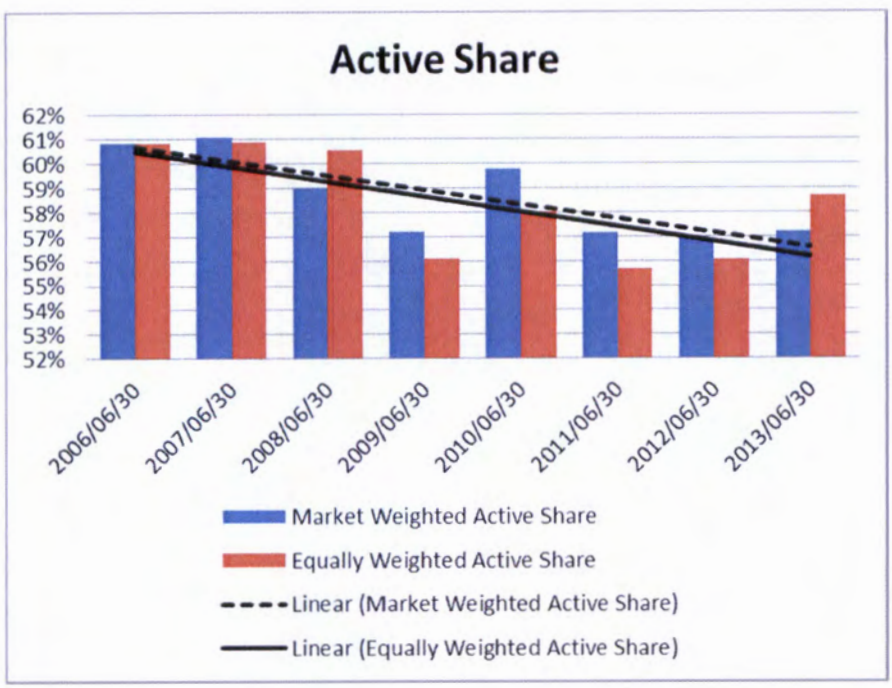
Question	Hypothesis	Test	Result and Significance (p-value)
Has average Active Share decreased significantly over the period under review?	Average Active Share at the end of the period is expected to be significantly lower than average Active Share at the beginning of the period	Wilcoxon signed rank	Not significant: 14.46%
Do managers experiencing both negative absolute and relative returns (quadrant 3) adjust their Active Share more than managers experiencing negative aboslute returns and positive relative returns (quadrant 1)?	Managers experiencing both negative absolute and relative returns (quadrant 3) are expected to adjust their Active Share more than managers experiencing negative aboslute returns and positive relative returns (quadrant 1)	Mann-Whitney U-test	Quadrant 3: Mean change of -13.7% Quadrant 1: Mean change of -6.6% Not significant: 10.38%
Do managers experiencing both positive absolute and relative returns (quadrant 2) adjust their Active Share more than managers experiencing positive aboslute returns and negative relative returns (quadrant 4)?	Managers experiencing both positive absolute and relative returns (quadrant 2) are expected to adjust their Active Share more than managers experiencing positive aboslute returns and negative relative returns (quadrant 4)	Mann-Whitney U-test	Quadrant 2: Mean change of 7.0% Quadrant 4: Mean change of 0.7% Not significant: 28.43%
Which styles have been able to produce an alpha over the entire period under review?	Concentrated stock picker is expected to be significantly greater than zero and closet indexer is expected to not be statistically greater than zero.	T-test	Concentrated stock picker: Significant: 3.9% Closet indexer: Not significant: 17.1%
Does concentrated stock picker exhibit the highest alpha?	Concentrated stock picker is expected to exhibit the highest alpha	None	Concentrated stock picker exhibits the 4th highest alpha out of 9 styles
Does closet indexer exhibit the lowest alpha?	Closet indexer is expected to exhibit the lowest alpha	None	Closet indexer exhibits the 4th lowest alpha out of 9 styles
Does concentrated stock picker demonstrate a higher alpha than closet indexer?	The mean demonsrated by concentrated stock picker is expected to be statistically greater than the mean alpha demonstrated by closet indexer	T-test	Concentrated stock picker: 2.73% Closet indexer: 0.66% Significant: 9.25%
Does concentrated stock picker perform the best out of any style in down markets?	Concentrated stock picker is expected to produce the highest alpha and lowest p-value.	T-test	Concentrated stock picker exhibits the highest alpha (18.51%) and lowest p-value (2.9%)
Does concentrated stock picker perform the best out of any style in bull markets to previous high?	Concentrated stock picker is expected to produce the highest alpha and lowest p-value.	T-test	Concentrated stock picker exhibits the highest alpha (2.47%) and lowest p-value (2.2%)
Does concentrated stock picker perform the best out of any style in bull market breaking through previous high?	Concentrated stock picker is expected to produce the highest alpha and lowest p-value.	T-test	Concentrated stock picker exhibits the lowest alpha (-2.59%) and is not significant given the p0value (18.8%)
Does the highest level of Active Share produce a higher alpha than the lowest level of Active Share?	The highest level of Active Share is expected to produce a higher alpha than the lowest level of Active Share	T-test	Concentrated stock picker: 3.46% Closet indexer: 1.29% Significant: 6.52%
Does the highest level of tracking error produce a higher alpha than the lowest level of tracking error?	The highest level of tracking error is expected to produce a higher alpha than the lowest level of tracking error	T-test	Concentrated stock picker: 1.97% Closet indexer: 1.29% Significant: 25.93%

7. Trend Analysis

Trends in Active Share, tracking error, JSE ALSI and volatility have been analysed over the period under review. A graphical analysis has been performed from a high level perspective before delving into the detailed sample statistics in the *Testing Results* section.

7.1. Trends in Active Share

The graph below illustrates the trend (referred to as linear) in aggregate Active Share from 2006/06/30 to 2013/06/30 on a yearly basis using an equally weighted average and a market weighted average. The average using an equally weighted basis includes each unit trust equally, whereas the average using a market weighted basis apportions each unit trust based on assets under management. One notices the downward trend in both equally weighted and market weighted Active Share.



7.1.1. Annual Market Weighted Active Share

Aggregate market weighted Active Share of 60.82% at the beginning of the period has decreased to 57.22% at period end. The measure reached its lowest point of 56.93% at 2012/06/30 and its highest point of 61.09% at 6/30/2007. Market weighted Active Share exhibits a gradual decline, except for a once-off surge to previous highs at 6/30/2010 when Active Share measured 59.76%. Although the decrease of 3.61% in Active Share over the period may not seem significant, one must consider that at the beginning of the period the average unit trust in the sample was not a closet indexer, yet at the end of the period the average unit trust in the sample was a closet indexer. A movement below the closet indexer level of 60% is noteworthy as it changes the label that one could apply to the South African general equity unit industry in aggregate.

7.1.2. Annual Equally Weighted Active Share

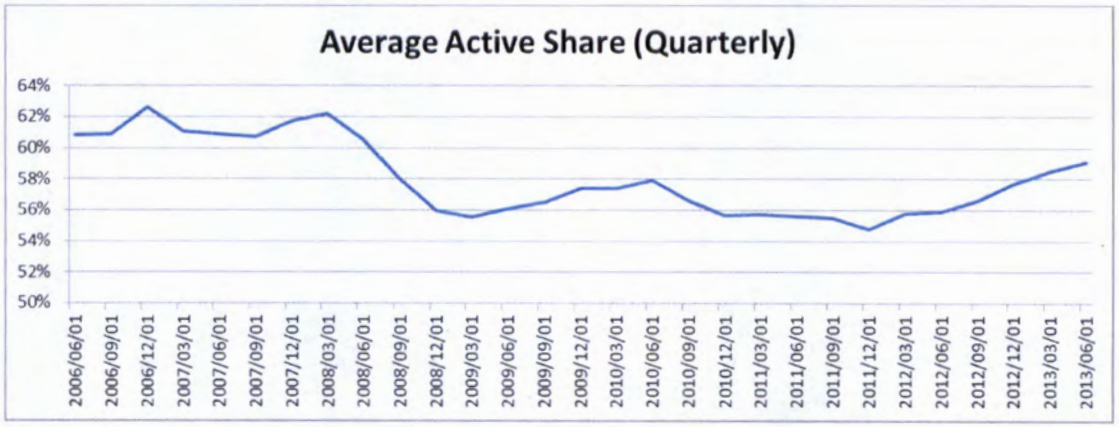
Similar trends have been demonstrated by equally weighted Active Share. An Active Share of 60.85% at the beginning of the period has dropped to 58.68% at period end. The Active Share reached a low of 55.65% at 6/30/2011 before increasing till period end. The average Active Share decreased by 2.17% over the period. On an equally weighted basis, the average unit trust is a closet indexer by the end of the period.

The difference between equally weighted and market weighted Active Share demonstrates the impact that particularly large unit trusts have on the results.

One notices that the trend in equally weighted Active Share is slightly steeper than the trend in market weighted Active Share over the period under review, but both exhibit a clear downward trend. The movement in Active Share over the period is not a gradual decline, but instead a haphazard one. The factors that contribute to changes in Active Share are investigated later in this study.

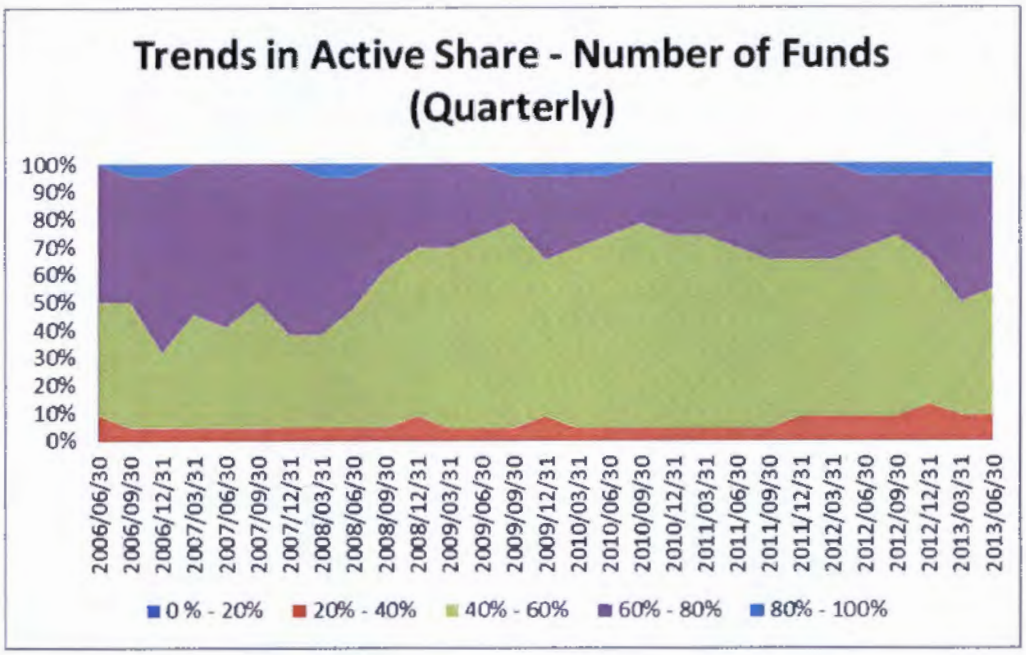
The p-value obtained when performing the Wilcoxon signed rank test described in the *3. Research Question* section is 14.46%. The p-value indicates that the null hypothesis stating that the means for the two groups are identical cannot be rejected at the 10% significance level.

7.1.3. Quarterly Equally Weighted Active Share



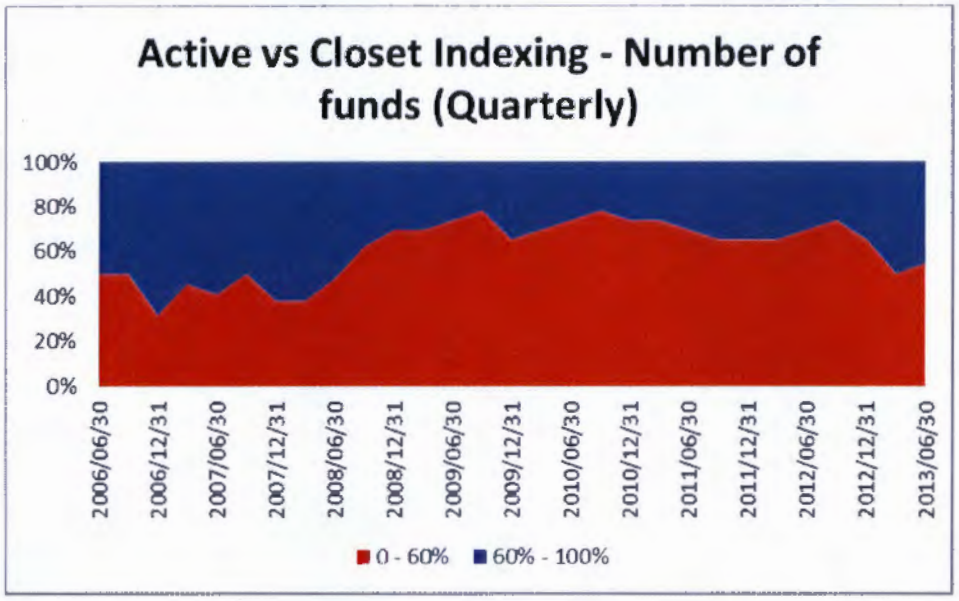
The line graph above shows the quarterly simple average Active Share for the sample of unit trusts over the period under review (equally weighted). One could categorise the entire period into sub-periods based on periods of dropping Active Share, a period of flat Active Share and a period of rising Active Share. The graph indicates that Active Share does not demonstrate very much variability over the short-term. Instead of demonstrating numerous highly variable highs and lows over the period, the graph above exhibits four orderly periods. The Average Active Share graph above exhibits four distinct periods - flat, sharp drop, flat and rise.

The Area chart below shows the portion of funds within the different bands of Active Share. The area within the 0% - 60% level is considered closet indexing by Cremers and Pejajisto (2009) and Petajisto (2010).

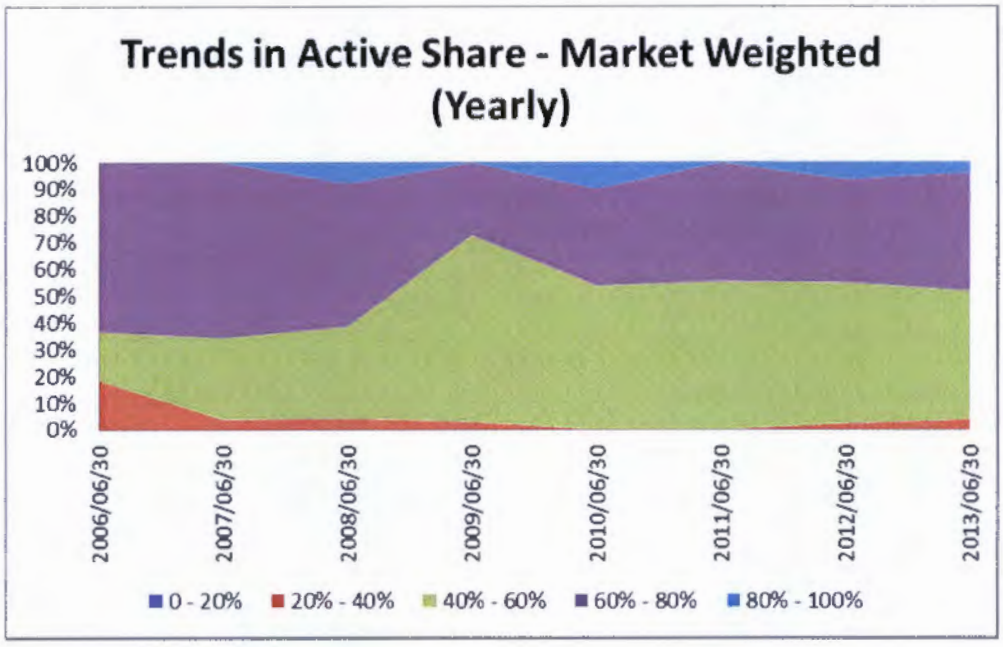


Throughout the period there are no funds that fall into the 0% - 20% category and few funds that fall into the 80% - 100% category. The largest portion of funds fall into the 40% - 60% and 60% - 80% category. One notices the sharp increase in closet indexing between the end of 2007 and the middle of 2009 and the sideways movement until a drop in the beginning of 2013. It appears that the preference managers have of holding a portfolio with a low Active Share became endemic from 2009 till 2012 as, although volatility had decreased, closet indexing remained high. The findings are in line with the contention that managers are more likely to closely follow the benchmark during bear markets, where underperformance is doubly painful, as it is lower than peers and negative, compared to bull markets where it is potentially lower than peers, but positive.

The graph shows that as at 9/30/2009, 78.26% of funds were considered to be closet indexers when using Cremers and Petajisto's (2009) measure. Cremers, Ferreira, Matos and Starks (2013) find that 30% of mutual funds are closet indexers (Exhibiting an Active Share of less than 60%) outside of the United States and 15% within the United States. On average 60.02% of funds were closet indexers, which is significantly higher than the United States and global averages.



The graph above provides a more focused look at active management versus closet indexing over the previous 7 years, per quarter. One notices the large increase in closet indexing during the financial crisis period and the recent decrease in closet indexing.

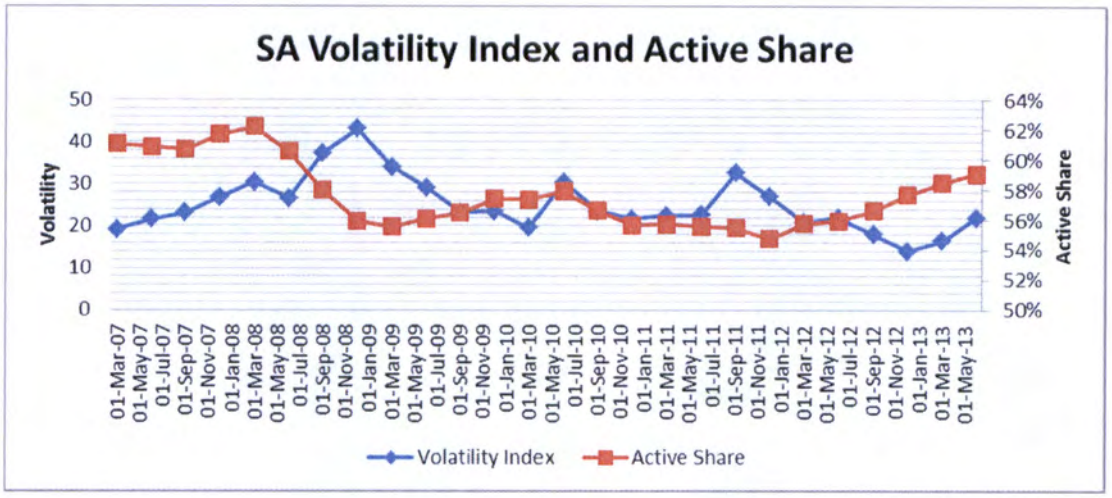


When analysing Active Share on a market weighted yearly basis (above), a similar trend is evident; a sharp increase in closet indexing during the financial crisis followed by a flat movement till the end of the period.

7.2. Active Share and Volatility

When comparing Active Share with the SAVI volatility index, one notices that the two appear to be negatively correlated. High volatility gives managers more reason to stay close to the benchmark as high volatility results in larger than normal differences between the return of a fund and its benchmark. The period of high volatility was characterised by losses due to the financial crisis. This observation is in line with that of Petajisto (2010) who finds that Active Share is negatively correlated to volatility.

Refer to the graph below for an analysis of Active Share and Volatility over time:



One notices that the initial period is characterised by high levels of Active Share and low levels of volatility. Active Share is relatively flat, peaking at 62.19% at 31/03/2008 and volatility is increasing from 19.21 at the beginning of the period to 30.4 at 31/03/2008. The beginning of the financial crisis, which increased volatility from 30.41 to a peak of 43.02, coincided with a decrease in Active Share from 62.19% to 55.94%. After that point until approximately 31/03/2012 Active Share and volatility are both at moderate levels. From 31/03/2012 onwards, volatility decreases to its lowest post the financial crisis level and as a result, Active Share increases to its highest post financial crisis level.

7.3. *Active Share and the JSE ALSI (J203)*

The graph above shows the movement in the JSE ALSI (J203) and the movement in Active Share over the period under review. The graph has clear periods of bull and bear markets and highlights the effect of the financial crisis. The analysis of tracking error, Active Share and alpha over the financial crisis and other market conditions forms a large part of this research paper. The final prolonged bull market has been sub-divided into the periods "up to previous highs" and the period "past previous highs" to ensure comparability with analyses of other measures in this research paper and to increase the quantum of analyses that can be performed. A sub-period comparison has been performed between Active Share and the JSE ALSI. The length of time and overlap between the different sub-periods has been performed below to investigate if there is any link between the movement in Active Share and the movement in the JSE ALSI. For instance, a rising JSE ALSI could overlap with a rising Active Share and vice versa. The following sub-periods have been identified:

Active Share:

A. 30/06/2006 – 31/04/2008 – Flat

B. 01/05/2008 – 31/12/2008 – Drop

C. 01/01/2009 – 31/03/2012 – Flat

D. 01/04/2012 – 30/06/2013 – Rise;

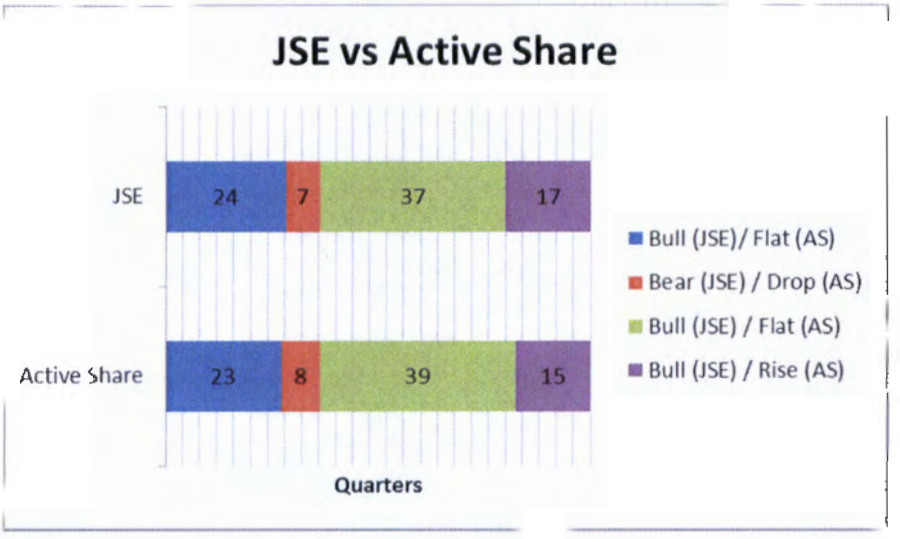
JSE ALSI index:

A. 30/06/2006 – 31/05/2008 – Bull Market

B. 01/06/2008 – 31/12/2008 – Financial Crisis

C. 01/01/2009 – 31/01/2012 – Bull Market to previous high

D. 01/02/2012 – 30/06/2013 – Bull Market breaking through previous high



The graph above demonstrates the overlap between sub-periods relating to Active Share and relating to the JSE ALSI. When calculating the number of quarters relating to each sub-period the above graph is formed. An almost exact match is evident. There is very clear overlap between the JSE and Active Share over periods one to four.

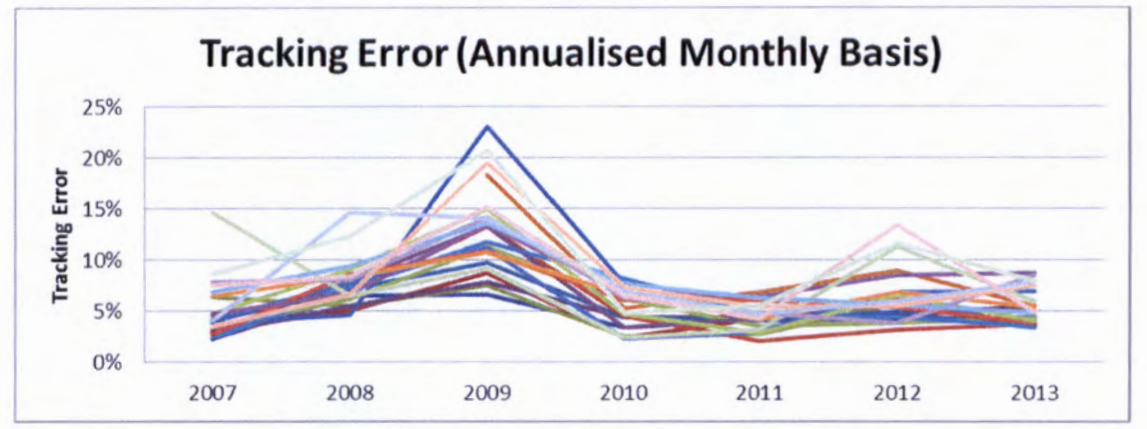
Inferences have not been drawn from the initial period, as trends may not be representative of the full bull-run. The initial period forms part of a much larger boom period which should be investigated in its entirety in order to make valid inferences. Investigating a portion of the much longer boom period could be misleading, as there may have been short significant increases or decreases in Active Share before 30/06/2008, which could be unaccounted for in the analysis above.

The results suggest that to a large extent:

- a rising market has either no effect on Active Share or relates to a rise in Active Share;
- a falling market relates to a falling Active Share;
- a falling market does not relate to a rise in Active Share;
- Active Share is sticky during bull markets and quick to react to bear markets;
- Active Share reacts faster to sharp increases/decreases and slower to slow increase/decreases; and
- during bear markets there is a need to reduce Active Share in order to reduce negative alphas, and in bull markets there is the possibility and willingness to increase Active Share in order to improve positive alphas.

7.4. *Trends in Tracking Error*

Tracking error was highly affected by the financial crisis experienced within the period tested. The Graph below shows the movement in tracking error for each fund over the period. Each line represents each fund in the sample:



One notices a large increase in tracking error over the 2009 period during the financial crisis. When viewing the volatility index and tracking error, one notices how closely correlated the two measures are to each other. It also indicates the deficiencies of the tracking error measure to solely explain active management. Active management as measured by Active Share actually decreased over the time period. An increase in tracking error indicates an increase in active management which is clearly not the case when considering the Active Share results. The measure is clearly affected or skewed by volatility when aiming to describe Active management. Active Share provides an unbiased measure that is not skewed by volatility as no standard deviation calculation is incorporated into its formula.

To more aptly demonstrate the effect of the financial crisis, tracking error has been calculated over the same four sub periods as previously used:

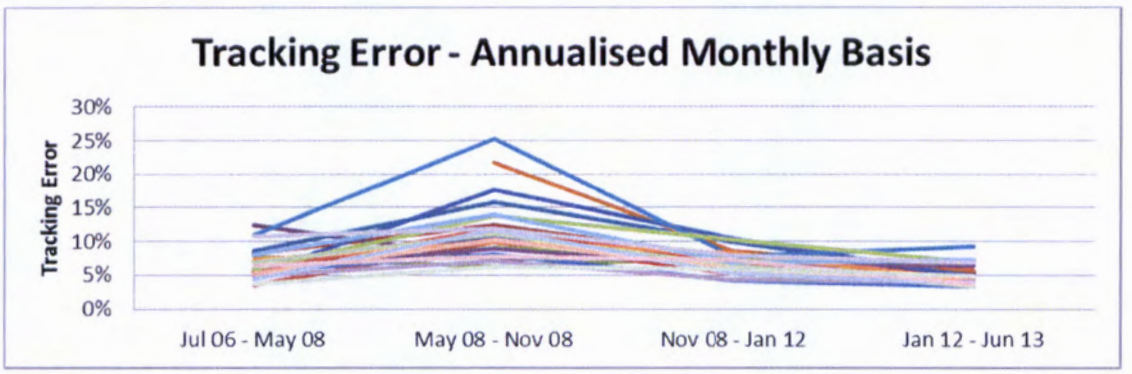
The following time periods were selected:

A. 30/06/2006 – 31/05/2008 – Bull Market

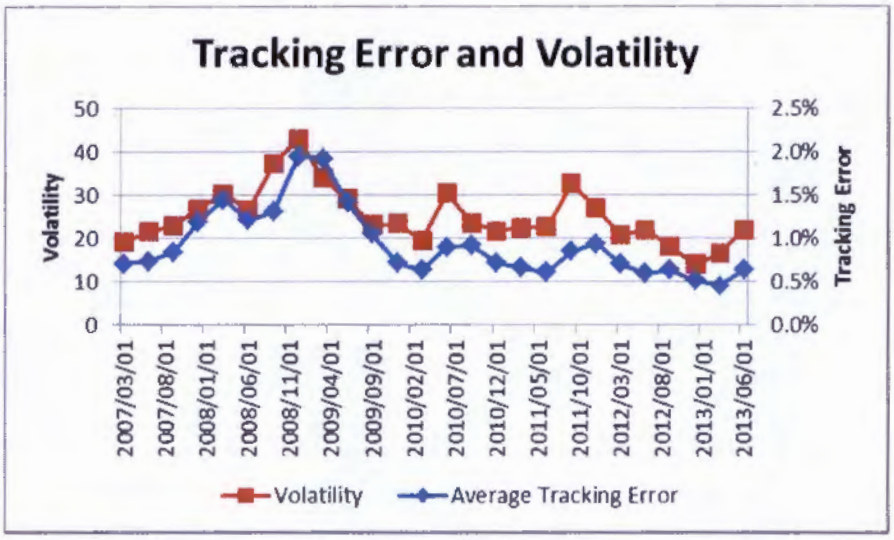
B. 01/06/2008 – 31/12/2008 – Financial Crisis

C. 01/01/2009 – 31/01/2012 – Bull Market to previous high

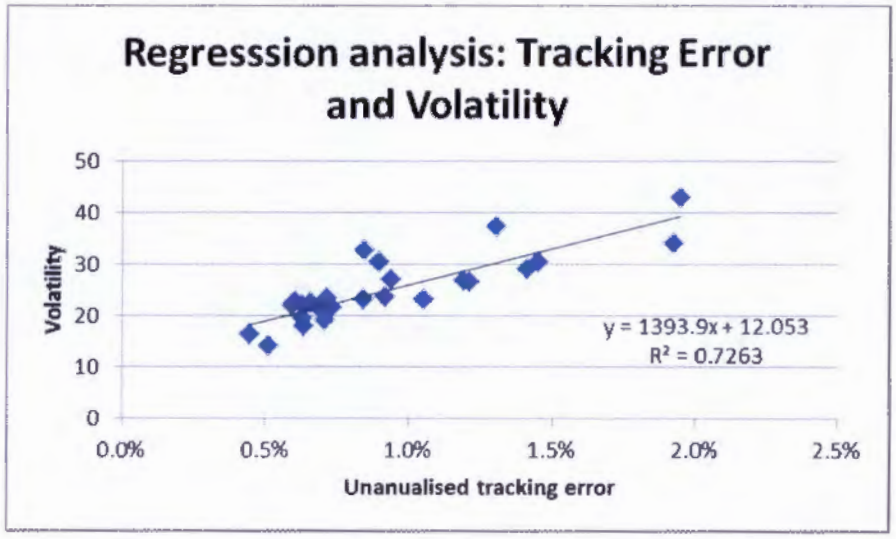
D. 01/02/2012 – 30/06/2013 – Bull Market breaking through previous high



A more orderly graph is arrived at, indicating that in periods of low volatility, tracking error is also similarly as static and in periods of high volatility, tracking error is similarly volatile. In periods other than the financial crisis, the graph is very compact, indicating that very similar low levels of tracking error were experienced by each fund and on average. The range of tracking errors is quite low over periods other than the financial crisis. During the financial crisis, a significant rise in tracking error occurred and the range of tracking errors increased significantly.



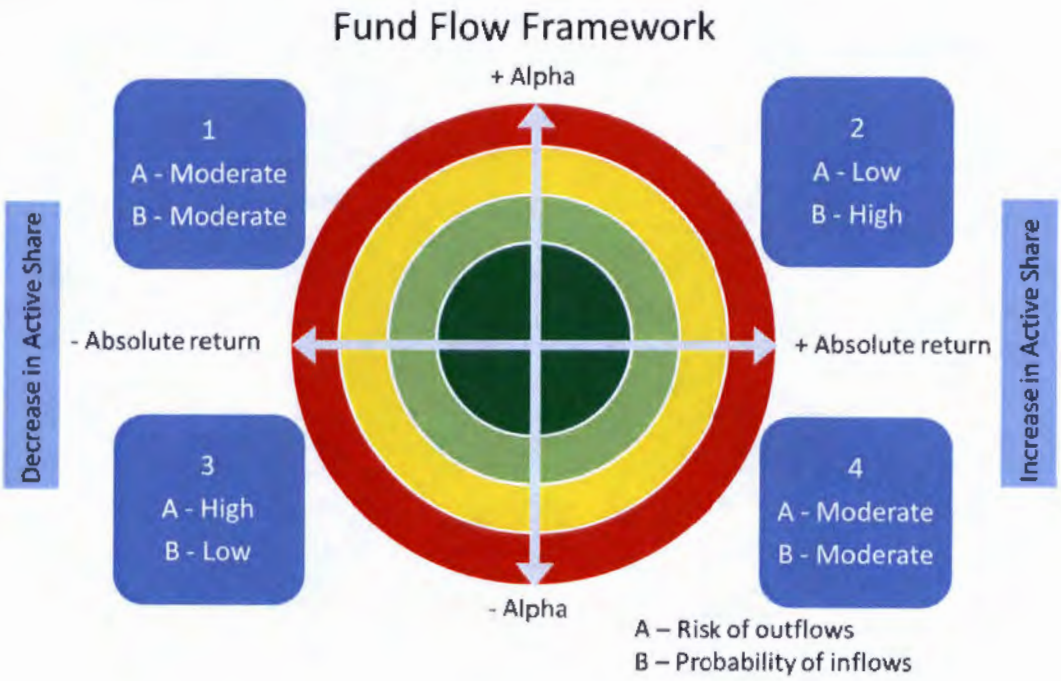
The graph above demonstrates the correlation between average un-annualised tracking error (there was no need to annualise) and volatility for the sample. The correlation is quite clear and the resulting p-value and R^2 of the regression testing performed is a significant 0.00% and 72.63%, respectively. The graph below demonstrates the results of the regression analysis performed:



8. Fund Flow Analysis

The trends identified in section *6.1.3 Active Share and the JSE ALSI (J203)* can be further analysed in a variety of ways and from a variety of perspectives. An analysis has been performed considering the risk of fund outflows and the possibility of fund inflows under different market conditions. Most managers are ultimately concerned with the size of their funds and whether investors are depositing more funds or withdrawing more funds. Hence the overall goal of any unit trust manager is to decrease the risk of outflows and increase the probability of inflows. The pressure to return absolute and relative returns (alpha) and the loss-aversion behaviour of investors is incorporated into the framework. Loss-aversion relates to investors disliking losses more than they enjoy gains. As a result of loss-aversion, managers are more pressured to avoid negative alphas than to strive for positive alphas.

Consider the following matrix illustrating different quadrants of absolute return and alpha, and the associated risk of fund outflows (A) and possibility of fund inflows (B):



The overall goal of a manager is to decrease A (Risk of outflows) and increase B (Probability of inflows), but the risk and probabilities are different depending on the combination of absolute return, alpha exhibited by a fund and market conditions.

One must note that although there is a general trend to reduce Active Share in times of negative absolute returns and a trend to increase Active Share in times of positive absolute returns, but these changes occur at varying degrees depending on where on the matrix the unit trust falls. In other words, in times of negative absolute returns, there is a general inclination for managers to move towards the inner circle, whereas in times of positive absolute returns there is a general inclination for managers to move towards the outer bands.

A manager would find himself in quadrant 1 during a down market while earning a positive alpha. A manager would find himself in quadrant 3 during a down market while earning a negative alpha. The financial crisis would be an example of such a period.

A manager would find himself in quadrant 2 during a bull market while earning a positive return. A manager would find himself in quadrant 4 during a bull market while earning a negative alpha. The time period post the financial crisis would be an example of such a period.

The crucial aspect of the matrix is that when a manager is earning one type of positive return, (either positive alpha and a negative absolute return or a negative alpha and a positive absolute return) the risk of fund outflows and possibility of inflows is moderate.

In other words, the risk of outflows (A) and possibility of inflows (B) is moderate when the investor is earning either a positive absolute return or a positive alpha, but not both. Investors are satisfied if they are earning at least one type of positive return. These conditions are satisfied in quadrant 1 and 4. Even though there is a general inclination for all managers to either increase or decrease their Active Share

depending on market conditions (bull or down markets), the pressures are moderate in quadrant 1 and 4. In quadrant 2, the investor is earning both a positive alpha and a positive return at which point the risk of fund outflows (A) is low and the possibility of inflows (B) is high. In quadrant 3, the manager is earning both a negative alpha and a negative absolute return. Under these conditions, there is a high risk of fund outflows (A) and a low probability of fund inflows (B). Consider that the risk of fund outflows or possibility of fund inflows becomes greater or smaller depending on how far from the centre of the graph the unit trust is placed. The red band represents unit trusts that deviate greatly from their benchmarks, whereas the center green circle represents unit trusts that deviate the least from their benchmarks. When managers are faced with quadrant 2 and 3 conditions, they will be more likely to move along the vertical axis, or from the outer band to the inner bank, compared to managers who find themselves in quadrant 1 and 4. When in quadrant, 2 a manager will attempt to move up the axis by increasing Active Share, whereas in quadrant 3 managers will decrease Active Share and move up the axis in order to decrease negative alpha. Below is an investigation of the sub-periods:

A. 30/06/2006 – 31/05/2008 – The initial period has not been analysed, as the trends may not be representative of the full bull-run. The period investigated forms part of a much larger boom period which should be investigated in its entirety in order to make valid inferences. Investigating a portion of the much longer boom period could be misleading, as there may have been short significant increases or decreases in Active Share before 30/06/2008 which would be unaccounted for in the analysis.
B. 01/06/2008 – 31/12/2008 – Decrease from previous high – This period not only represents a bear market, but is also considered by many market participants to represent a market crash. The period holds much informational content and allows one to investigate the effect of a crash on Active Share. Under these conditions all equity unit trust managers were faced with market conditions representing either quadrant 1 or 3. If a manager found himself in quadrant 3, he

would do his utmost to move as close to the green inner circle as possible. The main method of accomplishing that goal would be to be more aligned to his benchmark and thus Active Share would be reduced. There is more incentive for managers in quadrant 3 to move up the vertical axis (towards the green circle) than for managers in quadrant 1 to move down the vertical axis (towards the green circle). The overall goal would be to reduce the possibility of outflows and increase the possibility of inflows. To test this hypothesis, the unit trusts were divided into 2 groups, those that achieved positive alphas over the period and those that achieved negative alphas over the period. The change in Active Share was observed and the results are exhibited below:

	Quadrant 3	Quadrant 1
Average Alpha	-2.55%	2.43%
Average Active Share at 31 Mar 08	60.81%	61.89%
Average Active share on 31 Dec 08	52.46%	57.81%
Change	-13.7%	-6.6%

Quadrant 1 has achieved an average three month alpha of 2.43% over the period. The group decreased its Active Share by 6.6% over the sub-period. Quadrant 3 achieved a negative alpha of 2.55% over the sub-period and decreased its average Active Share by over double that of group 2, at 13.7%. The findings are in line with expectations. Managers in quadrant 3 have made more effort to move from the red band to the green circle compared to activity in quadrant 1. There is less incentive for unit trusts in quadrant 1 to change their Active Share, as the risk of fund outflows and the possibility of inflows is moderate. A Mann-Whitney U-test is performed to test if the mean change in Active Share for quadrant 3 is statistically greater than the mean change in Active Share for quadrant 1. The following null and alternative hypothesis is applicable:

$H_0: \mu_3 = \mu_1$

$H_a: \mu_3 < \mu_1$

where μ_3 is the sample mean for quadrant 3 and μ_1 is the sample mean for quadrant 1.

The p-value of 10.38% is arrived at which shows that the null hypothesis cannot be rejected at the 10% level.[4]

C. 01/01/2009 – 30/06/2013 – The remaining two sub-periods have been analysed together as managers would be in either quadrant 2 or 4 over the entire combined sub-period. If a manager found himself in quadrant 4, he they would be less inclined to move from the inner green circle to the outer red band as the risk of outflows and possibility of inflows is moderate. If however a manager found himself in quadrant 2, he they would target greater inflows of investor funds and increase his deviation from his peers to increase his alpha. There is more incentive for managers in quadrant 2 to attempt to move up the vertical horizontal axis (toward the outer red bands) than for managers in quadrant 4 to move down the same axis (towards the outer red bands) as the interplay between risk of fund outflows and possibility of fund inflow is different.

To test this hypothesis the unit trusts were divided into 2 groups, those that achieved positive alphas over the period and those that achieved negative alphas over the period. The change in Active Share was observed and the results are illustrated below:

	Quadrant 4	Quadrant 2
Average Alpha	-0.36%	0.58%
Average Active Share at 31 Dec 08	57.68%	55.19%
Average Active share on 30 Jun 13	58.08%	59.03%
Change	0.7%	7.0%

Quadrant 1 has achieved a negative alpha of 0.36% and has increased its Active Share by 0.7% and attempted to move towards the outer red circle marginally over the sub-period. Quadrant 2 has increased its Active Share by a greater margin in order to move up the vertical axis and towards the outer red bands. Group 2 has increased Active Share by 7.0% and achieved a positive alpha of 0.58%.The findings are in line with expectations. A Mann-Whitney U-test is performed to test if the mean change in Active Share for quadrant 2 is statistically greater than

[4] Refer to Appendix for normal test statistics.

the mean change in Active Share for quadrant 4. The following null and alternative hypothesis is applicable:

$H_0: \mu_2 = \mu_4$

$H_a: \mu_2 > \mu_4$

where μ_2 is the sample mean for quadrant 2 and μ_4 is the sample mean for quadrant 4. The p-value is 28.43% and so the null hypothesis cannot be rejected at any meaningful level of significance.[5]

The observed change in active share support the fund flow theory that unit trust managers are ultimately concerned with the flow of funds into and out of the unit trusts that they managed and attempt to increase the probability of fund inflows and decrease the risk of fund outflows by adjusting Active Share, but the results are not-significant at the 10% level.

[5] Refer to appendix for normal test statistics.

9. *Risk of Underperformance*

Managers attempt to keep their risk of underperformance (RoU) or probability of negative alpha constant or within an acceptable level. At times of high volatility, RoU increases and a method for managers to reduce their exposure is to adjust their deviation from their benchmark. The relationship can be represented by the following equation:

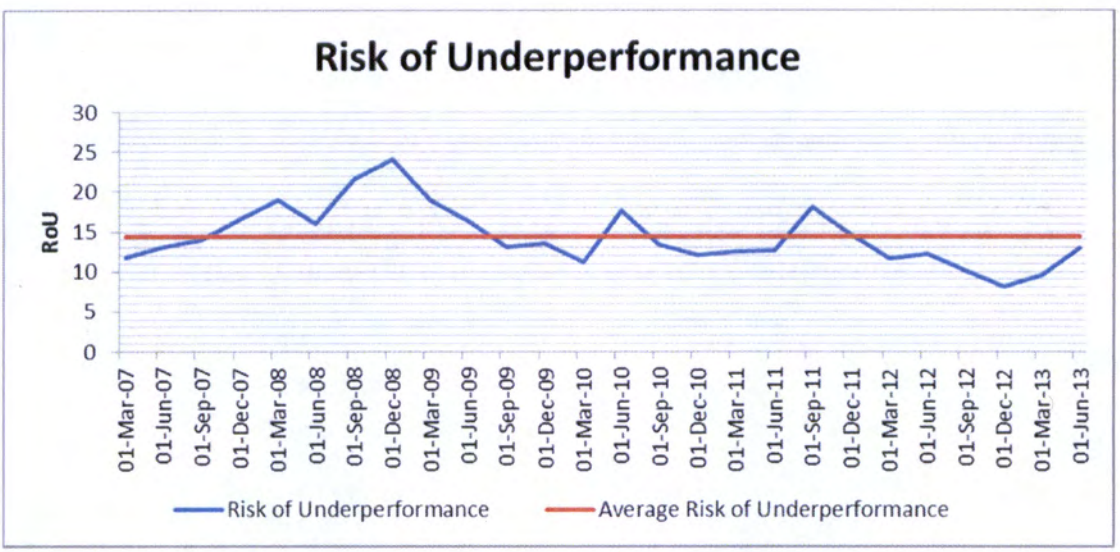
$$Risk\ of\ underperformance\ (constant\ or\ within\ a\ range) = deviation\ from\ benchmark\ (variable) * uncertainty\ (variable)$$

Managers attempt to keep their RoU constant which is considered a constant variable for the purposes of this analysis, even though managers would be content to keep this value within an acceptable range. Uncertainty is not within a manager's control, but instead is determined by numerous external factors. Uncertainty is constantly changing and managers must make portfolio decisions in reaction to these changes. Managers alter their portfolios in order to keep their RoU constant or within acceptable levels. In order for the equation to hold, an increase in uncertainty should be offset by a decrease in deviation from the respective benchmark.

A proxy for deviation from the respective benchmark is Active Share and a proxy for uncertainty is a volatility index. An increase in volatility should anticipate a change in Active Share and large shifts in the volatility index should also anticipate large shifts in Active Share. One would expect the calculated RoU value to be constantly increasing and decreasing, yet to remain within a particular range. Any breaches of that range would result in portfolio adjustments and thus changes in Active Share.

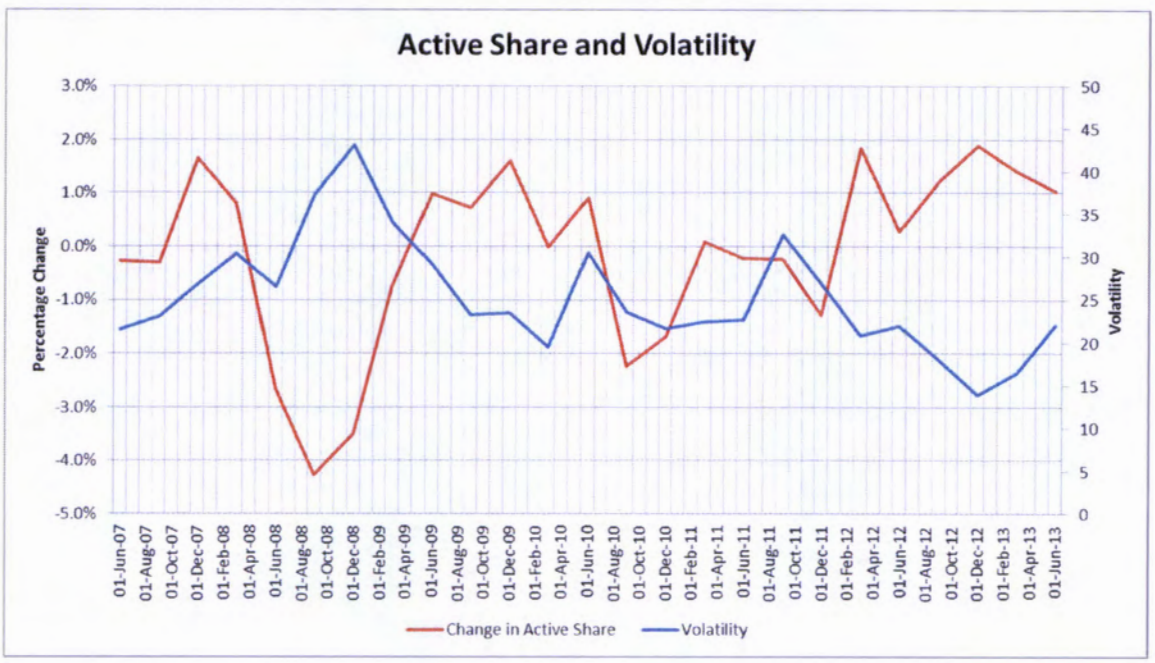
The graph below shows the calculated RoU for the sample over the period under review. The average RoU is calculated at 14.44. For any movement above an acceptable level of risk, a portfolio change will occur that will gradually bring the risk to within an acceptable range. At high levels of risk,

managers *need* to reduce their Active Share to reduce their RoU and at low levels of risk managers are *able* to seek higher levels of Active Share in order to produce an alpha. One would expect, over time, for the RoU to fall within an acceptable band and perhaps the current level can be compared to historical levels as an indication of the level of risk capital in the market.



At the beginning of the period the RoU is at a below average level of 11.73. There is a large increase in the measure around the financial crisis as expected. The RoU reaches its highest level of 24.07 at 31/12/2008. The RoU stays within 5 units either side of the average of 14.44 until the end of the period, when the measure decreases to its lowest level of 8.07 at 31/12/2012.

The graph below attempts to illustrate the contention that large increases and decreases in volatility either require managers to reduce Active Share or allow managers to increase Active Share, depending on market conditions.



Anticipated or actual levels of high volatility should precipitate large negative changes in Active Share and anticipated or actual levels of low volatility should precipitate large increases in Active Share.

Analysis is performed over the following periods:

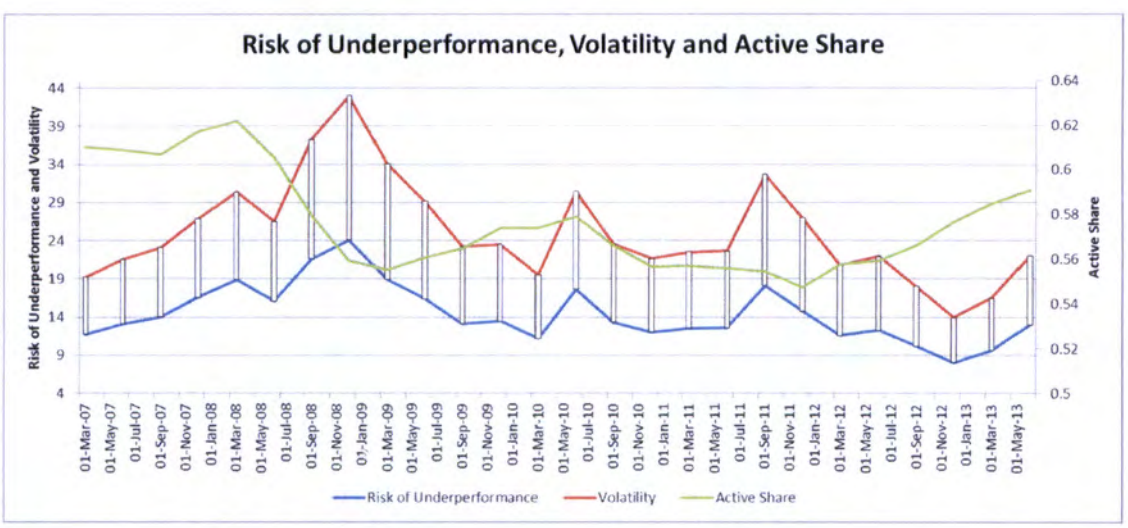
A. 30/06/2006 – 31/05/2008 – Bull Market – The period is mostly characterised by moderate, but increasing levels of volatility and positive changes in Active Share. The final two months of the bull market do however exhibit fairly large decreases in Active Share that precede the financial crisis.

B. 01/06/2008 – 31/12/2008 – Financial Crisis – During this period, volatility increases substantially beyond acceptable levels which encouraged large decreases in Active Share. The large decreases in Active Share did however slow down towards the end of the period, which preceded the recovery period.

C. 01/01/2009 – 31/01/2012 – Bull Market to previous high – Volatility is within acceptable levels within this period and changes in Active Share initially shifts from negative changes to positive changes. Changes in Active Share continue to be moderate, with only one data point exceeding a 2% change in Active Share.

D. 01/02/2012 – 30/06/2013 – Bull Market breaking through previous high – This period exhibits lower than average levels of volatility and continued increasing levels of Active Share.

The graph below illustrates the impact that Active Share has on the RoU. Consider what the extreme levels of Active Share will have on RoU; an Active Share level of 100% would have no impact on volatility (uncertainty) whereas an Active Share level of 0% would effectively reduce the volatility (uncertainty) to 0%. This makes intuitive sense as a pure index fund exhibiting an Active Share of 0% should never underperform the market.



The bars between RoU and volatility represent the impact that Active Share has on the RoU. One notices that at lower levels of Active Share there is a large differential and at high levels of Active Share there is a low differential. The differential is dependent on the level of volatility and the level of Active

Share. High levels of volatility and high levels of Active Share will result in a large differential, whereas for similar levels of Active Share and low levels of volatility, smaller differentials will be experienced. The differential peaks at 18.95 on 2008/12/31 which is shortly after the end of the financial crisis. This point in time exhibits a high level of volatility and a low level of Active Share. The differential is at its lowest level of 5.92 at 2012/12/31. This point in time exhibits high levels of Active Share and low levels of volatility. The average differential over the period is 10.62. At high levels of volatility one would expect the differential to be high as managers are purposefully keeping to at low levels of Active Share as since they *need* to reduce their risk. At low levels of volatility one would expect the differential to be low as managers are *able* to take on more risk through high Active Share.

This research paper contends that anticipated and actual high levels of RoU drive changes in Active Share. Active Share can therefore be considered a variable used to increase or decrease risk. The short-term movement in Active Share can be a leading indicator of the anticipated risk in the market. A decrease in Active Share could anticipate increased volatility or a downturn in the market, whereas an increase in Active Share could anticipate a decrease in volatility and an increase in the market.

10. Testing Results

10.1. Style and Performance

Testing has been performed using the aforementioned methodology over the time period specified. Refer to the sample statistics below:

Statistic	Population	Closet Indexer	Moderately Active Diversifier	Diversified Stock Picker	Active Sector Bets	Moderately Active	Aggressive Stock Picker	Sector Rotator	Aggressive Sector Bets	Concentrated Stock Picker
Count	638	86	77	33	59	82	77	51	59	114
Mean Alpha	0.46%	0.17%	0.60%	0.25%	0.10%	0.94%	-0.10%	0.74%	0.57%	0.68%
Mean Alpha Annualised	1.85%	0.66%	2.42%	1.01%	0.42%	3.80%	-0.39%	3.01%	2.32%	2.73%
Rank		7	4	6	8	1	9	2	5	3
Std Dev	4.09%	2.57%	3.35%	4.55%	2.26%	3.27%	5.22%	2.33%	3.25%	6.24%
Rank		7	4	3	8	5	2	9	6	1
Sharpe Ratio	11.23%	6.43%	17.90%	5.55%	4.62%	28.66%	-1.87%	31.89%	17.65%	10.85%
Rank		6	3	7	8	2	9	1	4	5
Min	-14.69%	-6.82%	-8.11%	-14.69%	-3.99%	-5.39%	-14.61%	-2.93%	-5.15%	-13.22%
Min Annualised	-47.04%	-24.62%	-28.71%	-47.04%	-15.01%	-19.88%	-46.84%	-11.21%	-19.07%	-43.29%
Median	0.35%	0.39%	0.37%	0.46%	0.30%	0.72%	-0.56%	0.61%	0.18%	0.44%
Median Annualised	1.42%	1.56%	1.48%	1.85%	1.21%	2.91%	-2.22%	2.47%	0.74%	1.78%
Rank		5	6	3	7	1	9	2	8	4
Max	32.34%	5.91%	11.11%	7.04%	7.05%	12.41%	16.72%	8.09%	13.03%	32.34%
Max Annualised	206.74%	25.80%	52.41%	31.26%	31.33%	59.67%	85.60%	36.50%	63.22%	206.74%
T-stat p-value		17.1%	2.8%	23.8%	27.5%	0.3%	31.0%	1.0%	5.5%	3.9%
Rank		6	3	7	8	1	9	2	5	4

Surprisingly, the sample exhibits an annualised mean return of 1.85%. This appears to be intuitively incorrect as the sample should exhibit a negative mean, due to fees, in line with studies testing performance of active versus passive management. Nana (2011) investigates performance of the South African unit trust industry from 2001 till 2010 and finds that unit trusts, on average, outperformed the ALSI gross and net of fees. A cumulative return of 488.38% for unit trusts was found, compared to a return on the ALSI of 429.90%. This results in a cumulative outperformance of 58.49%. On an annualised basis unit trusts have returned 19.39% compared to 18.15% of the ALSI, demonstrating an outperformance of 1.24%. The findings of Nana (2011) indicate that the counterintuitive alpha exhibited by the sample is possible.

The number of observations representing the sample is 638. In certain quarters either a portion of funds were not in existence or data was not available and excluded from the analysis. There are a varying number of observations per category due to the random combination of groups caused by the grouping methodology. Clearly, the best performing group using annualised alpha has been moderately active (3.80%). The group can be viewed as having the median Active Share and tracking error of the sample group and is therefore the style category of funds that take average active bets. Aggressive stock picker is the group with the lowest alpha (-0.39%). All but one group exhibit a positive mean annualised alpha indicating that the majority of categories have outperformed their benchmarks. Concentrated stock pickers have performed the third best with an alpha of 2.73%, behind that of sector rotators achieving an alpha of 3.01%. Closet indexers are the third worst performing group with an alpha of 0.66%. The only groups to perform worse than the closet indexers are active sector bets with an alpha of 0.42% and aggressive stock pickers with an alpha of -0.39%.

When dividing the categories into three groups in order of highest to lowest Alpha, the following is evident:

Top Tercile	Moderately Active, Sector Rotator, Concentrated Stock Picker
Middle Tercile	Moderately Active Diversifier, Aggressive Sector Bets, Diversified Stock Picker
Bottom Tercile	Active Sector Bets, Closet Indexer, Aggressive Stock Picker

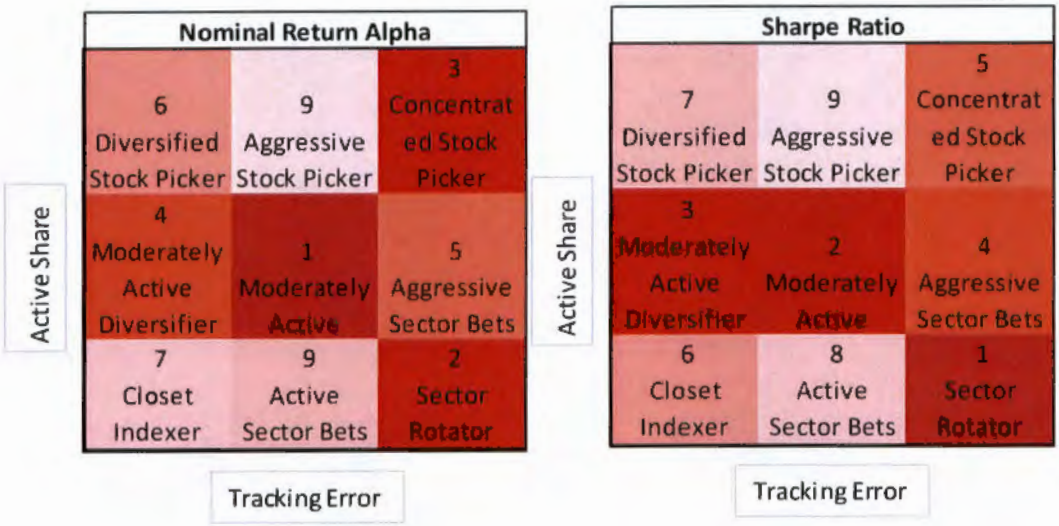
Although the hypothesis has not been correct in terms of concentrated stock pickers exhibiting the highest alpha, the group is in the top third with respect to its alpha, and closet indexers are in the bottom third. Interestingly, Diversified stock picker and Aggressive stock picker do not feature in the top third which is unexpected, as one would expect to be rewarded for additional risk measured by Active Share.

Concentrated stock picker has outperformed closet indexer by an annualised 2.07% over the period tested. In line with expectations, the return benefit from investing in funds that exhibit the highest possible Active rating based on Active Share and tracking error, compared to funds that exhibit the lowest such rating is clear. The benefits of identifying and avoiding managers that engage in closet indexing is also clear.

The group with the highest standard deviation is concentrated stock picker. The finding is in line expectations as the category is perceived to have the highest risk given that the group is the combination of the highest Active Share and tracking error. Aggressive stock picker and diversified stock picker are the second and third more variable categories, respectively. The least variable groups are sector rotator, active sector bets and closet indexer which indicates that the groups with the lowest Active Share are also the least variable. The findings suggest a strong positive correlation between Active Share and variability or risk. As one travels up the vertical axis or level of Active Share on the diagram below, one experiences large increases in variability and moderate increases in returns. If one travels along the horizontal axis or level of tracking error, one experiences large increases in returns and moderate increases in variability. The implication is that on a risk adjusted basis one is rewarded more for increasing tracking error compared to increasing Active Share.

On a risk adjusted basis, using the Sharpe ratio, moderately active (28.66%) has been exceeded by the sector rotator group (31.89%) which is the best risk adjusted performer over the entire period under review. The worst performing group on a risk adjusted basis is aggressive stock picker (-1.87%). It appears that diversified and aggressive stock pickers are not rewarded for the additional risk as demonstrated by ranking last and third last in terms of the Sharpe ratio.

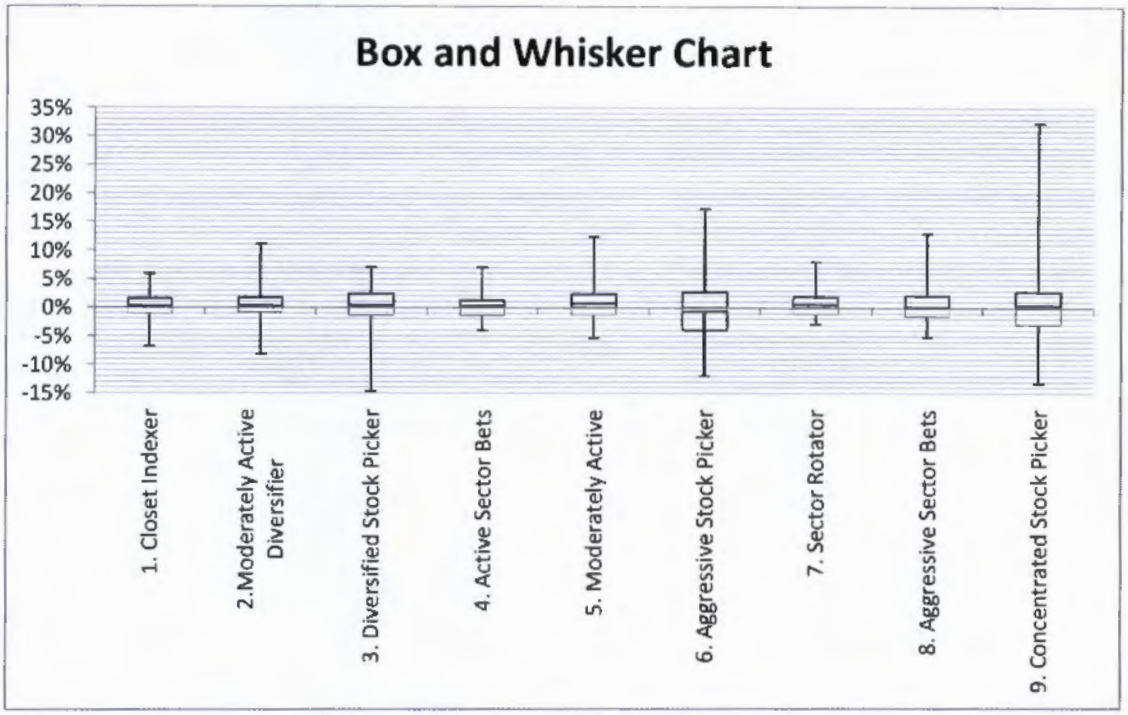
The annualised mean return over the review period relating to concentrated stock picker is statistically greater than that of closet indexer as demonstrated by a p-value of 9.25%.



The figures above indicate the ranking of groups using nominal returns and the Sharpe ratio. The highest return is represented by a dark shaded block that gradually becomes lighter indicating the lowest performing block. One notices the darker shading in the middle and on the right of both figures indicating that outperformance is associated with higher tracking error and moderate Active Share. Closet indexers have displayed the third worst performance of any category. Remaining in the moderately active unit trust category over the time period, as opposed to the closet indexer category would have resulted in an outperformance of 3.14% per year, on an annualised basis.

The results of the statistical testing indicate that the null hypothesis can be rejected at the 10% level for five of the styles tested. Moderately active is the most statistically different from zero with a p-value of 0.3%. Concentrated stock picker is the 4th most statistically different from zero, with a p-value of 3.9%. The null hypothesis can be rejected at the 10% level for the concentrated stock picker style. The concentrated stock picker is more statistically significant than the closet indexer which displays a p-value of 17.1%. [6]

[6] Refer to appendix for normal test statistics



The box and whisker chart above provides one with an indication of the range, 1st quartile, 3rd quartile and median of the different styles on a 3 month return basis. The styles with the highest Active Share (diversified stock picker, aggressive stock picker and concentrated stock picker) exhibit the highest ranges out of all the groups, and the groups with lowest Active Share (closet indexer, active sector bets and sector rotators) exhibit the lowest range. All the groups display a median return above zero, except for aggressive stock picker with a median alpha of -0.56%. Moderately active, which exhibits the highest median alpha, exhibits a range far lower than that of concentrated stock picker, particularly on the downside, which indicates its superiority from a risk return basis.

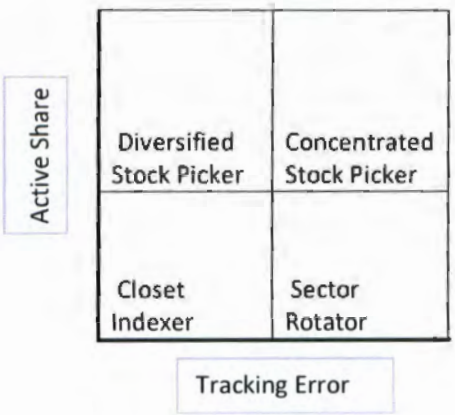
There is a general increase in the range displayed by the groups when considering the groups that fall into the first, second and third tercile. The first group falling into the lowest Active Share level consists of groups 1, 4 and 7 which clearly display the lowest range. The second group consisting of 2, 5 and 7 clearly displays the next highest range. The group with the highest Active Share consisting of 3, 6

and 9 exhibits the highest range. When analysing the box and whisker chart from a tracking error perspective there is no clear relationship between tercile 1, 2 and 3 based on tracking error and range. It appears that there is a stronger relationship between Active Share and range compared to tracking error and range.

The graph above shows the movement in the styles of managers over the time period per quarter. One notices that there is much variability from quarter to quarter.

10.2. Bull and Bear Market Performance

Testing was performed over differing time periods to ascertain which styles perform best under differing market conditions. Unfortunately, it was deemed that there were not enough data points in certain time periods to produce reliable results for every style. As a result the labelling exercise was limited to the 2 by 2 matrix below (refer to *3. Research Question)*:



Funds were split into high and low groups for both Active Share and tracking error and labelled each quarter. The following time periods were tested:

A. 30/06/2006 – 31/12/2007 – Bull Market

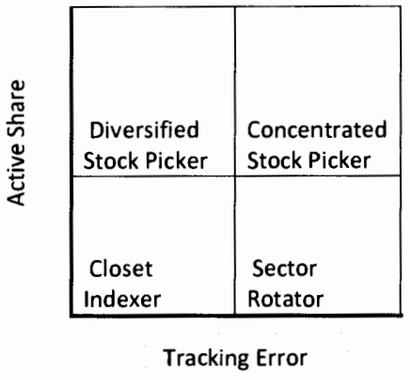
B. 01/01/2008 – 31/12/2008 – Financial Crisis

C. 01/01/2009 – 31/12/2011 – Bull Market to previous high

D. 01/01/2012 – 30/06/2013 – Bull Market breaking through previous high

These time periods have been identified and analysed, because managers experience differing pressures in differing market conditions. Investors evaluate managers based on two measures; absolute performance (positive or negative) and relative performance (relative to its benchmark). During a bear market a manager runs the risk of exhibiting both absolute and relative underperformance, whereas during a bull market a manager is assured of at least exhibiting a positive absolute return. A method used to ensure that at least only one form of underperformance is experienced in bear markets is for managers to closet indexing, thereby reducing the probability of relative underperformance.

During periods of subsequent bull markets to previous highs, returns are often measured with reference to previous lows and previous highs. As long as the market remains at a level between the two levels, investors expect the market to return to previous highs over the short to medium term. A bull run



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beyond previous highs is a riskier period for managers as there is more uncertainty and no reference price.

10.2.1. Results A: Bull Market

The initial period has not been analysed, as the trends may not be representative of the full bull-run. The period investigated forms part of a much larger boom period which should be investigated in its entirety in order to make valid inferences. Investigating a portion of the much longer boom period could be misleading, as there may have been short significant increases or decreases in Active Share before 30/06/2008 which would be unaccounted for in the analysis.

10.2.2. Results B: Financial Crisis

The following table represents the sample statistics over the sub-period:

01/04/2008 - 31/12/2008	Population	Closet Indexer	Diversified Stock Picker	Sector Rotator	Concentrated Stock Picker
Count	69	18	15	15	21
Mean Alpha	1.35%	0.42%	-1.63%	1.27%	4.34%
Mean Alpha Annualised	5.52%	1.70%	-6.35%	5.17%	18.51%
Rank		3	4	2	1
Std Dev	8.77%	4.99%	7.45%	4.07%	13.15%
Rank		3	2	4	1
Sharpe Ratio	15.42%	8.47%	-21.84%	31.17%	32.98%
Rank		3	4	2	1
Min	-14.69%	-6.82%	-14.69%	-3.51%	-14.61%
Min Annualised	-47.04%	-24.62%	-47.04%	-13.32%	-46.84%
Median	0.45%	0.93%	-3.36%	1.58%	2.85%
Median Annualised	1.82%	3.76%	-12.78%	6.46%	11.88%
Rank		3	4	2	1
Max	32.34%	11.11%	12.34%	8.09%	32.34%
Max Annualised	206.74%	52.41%	59.27%	36.50%	206.74%
T-test p-value		26.4%	34.3%	9.6%	2.9%
Rank		3	4	2	1

01/04/2008 – 31/12/2008	
Active Share average	59.44%
Active Share standard deviation	11.15%
Tracking error average	1.327%

The fall of the JSE ALSI over the period was 28.35%. The sample, based on 69 observations has, on average, produced an annualised alpha of 5.52% over the financial crisis period. Even though negative returns have been earned, the returns are on average 5.52% better than that of the average respective benchmark. The group of actively managed funds tested performs significantly better than their benchmarks over the financial crisis. This finding could highlight why a large portion of investors choose to invest their funds actively instead of passively; the reduction of downside risk and the loss-averse nature of investors. The risk/return trade-off of actively managed funds appears to cater well for the risk/return preferences of investors in that the risk/return trade-off of investors is not symmetrical. Standard deviation of return for the sub-period has increased significantly from 3.53% in the previous period to 8.77% as a result of the financial crisis.

There is much variation in performance between styles. The lowest performing style is diversified stock pickers which have produced an annualised alpha of -6.35%. The performance of this style is 24.86% lower than that of the highest performing style. The best performing style is concentrated stock picker with an annualised alpha of 18.51%. Closet indexers are the second worst performing style exhibiting an annualised alpha of 1.70%. Concentrated stock pickers have outperformed closet indexers by 16.81%. Even though the concentrated stock picker has outperformed the second highest alpha producing style, the sector rotator, by 13.35%, the respective Sharpe ratios of the two styles are very similar. Concentrated stock pickers and sector rotators exhibit a Sharpe ratio of 32.98% and 31.17%, respectively. The similar Sharpe ratios and dissimilar alphas are caused by a large differential in the standard deviation of the two styles. Concentrated stock pickers are far riskier than sector rotators,

exhibiting a standard deviation of 13.15% and 4.07%, respectively. Consider that these two styles fall into the same tracking error category, but different Active Share categories. It appears that concentrated stock pickers take on a greater amount of risk for every unit of reward they earn.

The highest 3 month alpha earned by any of the unit trusts in the sample was earned by a unit trust within the concentrated stock picker category of 32.34%. The lowest 3 month alpha was earned by the diversified stock picker group of -47.04%. The sector rotator has a much lower range than that of the concentrated stock picker with a maximum and minimum three month return of 8.09% and -3.68%.

The sample exhibits an average Active Share of 59.44% over the sub-period which is a drop from 61.16% exhibited by the first sub-period. The standard deviation of Active Share has also increased from 10.16% to 11.15%. Average un-annualised six month rolling tracking error has increased from 0.966% to 1.327%.

There are two styles for which the null hypothesis can be rejected at the 10% level. These are concentrated stock picker and sector rotator. Sector rotator exhibits the lowest p-value, with 2.9%.[7]

[7] Refer to appendix for normal test statistics

10.2.3. Results C: Bull Market to Previous High

The following table represents the sample statistics over the sub-period:

01/01/2009 - 31/12/2011	Population	Closet Indexer	Diversified Stock Picker	Sector Rotator	Concentrated Stock Picker
Count	276	77	55	55	89
Mean Alpha	0.45%	0.34%	0.44%	0.33%	0.61%
Mean Alpha Annualised	1.80%	1.37%	1.79%	1.34%	2.47%
Rank		3	2	4	1
Std Dev	2.79%	2.05%	2.84%	2.34%	3.52%
Rank		4	2	3	1
Sharpe Ratio	16.04%	16.64%	15.64%	14.29%	17.41%
Rank		1	2	4	3
Min	-7.26%	-3.55%	-6.33%	-3.68%	-7.26%
Min Annualised	-26.03%	-13.47%	-23.02%	-13.93%	-26.03%
Median	0.39%	0.39%	0.38%	0.02%	0.66%
Median Annualised	1.56%	1.57%	1.54%	0.10%	2.68%
Rank		3	2	4	1
Max	12.20%	5.91%	8.13%	7.57%	12.20%
Max Annualised	58.48%	25.80%	36.69%	33.88%	58.48%
T-test p-value		4.6%	7.7%	10.3%	2.2%
Rank		2	3	4	1

01/01/2009 – 31/12/2011	
Active Share average	56.44%
Active Share standard deviation	10.27%
Tracking error average	1.028%

The JSE ALSI rose by an un-annualised 46.56% over the sub-period. The sample, consisting of 276 observations, outperformed the market by an annualised amount of 1.80% over the period. The sample experienced significant absolute and significant relative gains over the period. Standard deviation for the sample has decreased significantly from the previous sub-period. The standard deviation of 8.77% has decreased to 2.79%.

The best performing style on an annualised alpha basis is concentrated stock picker with 2.47%. The worst performing style is sector rotator with 1.34%. There is less variance in performance between

styles compared to the financial crisis sub-period and all styles have returned a positive alpha. The highest Sharpe ratio relates to concentrated stock picker with 17.41%, the lowest Sharpe ratio belongs to sector rotator with 14.29%. There is also far less variability in Sharpe ratios when compared to the financial crisis sub-period.

Concentrated stock picker continues to perform the best out of any style, but although the difference between best and worst performing styles is not as significant compared to the financial crisis sub-period. The difference between the best performing style and the worst performing style is 1.13% compared with 24.87% in the financial crisis period. It appears that there is far greater benefit from discerning between styles within a downturn or financial crisis as opposed to a subsequent upturn.

The average Active Share for the sample over the sub-period has decreased to 56.44% from 59.44% over the financial crisis sub-period. The dispersion of Active Share has also decreased from a standard deviation of 11.15 to 10.27. It appears that the sample of unit trusts has become more similar over the period demonstrated by less variation in the Active Share rating and a decrease in tracking error from 1.327% to 1.028%.

The reduction of variation in returns is a consequence of the reduction in variation of holdings in the group. As all funds begin deviating less from the benchmark, they also start deviating less from their peers and as a result their returns become less varied.

The highest and lowest 3 month return earned by any of the unit trusts in the sample was earned by a unit trust within the concentrated stock picker category of 12.28% and -7.26%.

The null hypothesis is rejected at the 10% level for concentrated stock pickers, closet indexers and diversified stock picker. Concentrated stock picker displays the lowest p-value of 2.2%.[8]

10.2.4. Results D: Bull Market Breaking Through Previous High

The following table represents the sample statistics over the sub-period:

01/01/2012 - 30/06/2013	Population	Closet Indexer	Diversified Stock Picker	Sector Rotator	Concentrated Stock Picker
Count	138	34	32	32	40
Mean Alpha	-0.02%	0.37%	-0.15%	0.48%	-0.65%
Mean Alpha Annualised	-0.09%	1.47%	-0.60%	1.92%	-2.59%
Rank		2	3	1	4
Std Dev	3.07%	2.32%	3.96%	2.49%	3.22%
Rank		4	1	3	2
Sharpe Ratio	-0.76%	15.80%	-3.79%	19.15%	-20.28%
Rank		2	3	1	4
Min	-10.35%	-3.60%	-10.35%	-3.95%	-8.72%
Min Annualised	-35.40%	-13.65%	-35.40%	-14.88%	-30.58%
Median	-0.23%	-0.02%	-0.33%	0.44%	-1.04%
Median Annualised	-0.93%	-0.08%	-1.33%	1.77%	-4.09%
Rank		2	3	1	4
Max	7.37%	4.77%	6.81%	6.95%	7.37%
Max Annualised	32.89%	20.51%	30.17%	30.82%	32.89%
T-test p-value		14.0%	45.7%	11.0%	16.8%
Rank		2	4	1	3

01/01/2012 – 31/06/2013	
Active Share average	56.66%
Active Share standard deviation	11.79%
Tracking error average	0.637%

The JSE ALSI rose by an un-annualised 20.96% over the period. The sample, consisting of 138 observations, underperformed the market by an annualised amount of -0.09% over the period. Standard

[8] Refer to appendix for normal test statistics

deviation has remained relatively flat compared to the previous sub-period increasing from 2.79% to 3.07%.

The best performing style and the only style to exhibit a positive alpha is sector rotator that achieved an alpha of 1.92%. The second best performing style was closet indexer that exhibited an alpha of 1.47%. The worst performing style is concentrated stock pickers that exhibited an annualised underperformance of -2.59%. Concentrated stock pickers fortunes have changed dramatically compared to the bull market to previous high sub-period. The style has decreased its annualised alpha by 5.06%, resulting in a large underperformance.

Concentrated stock pickers' returns are very volatile and exhibit a large negative Sharpe ratio of -20.28%. The best Sharpe ratio is achieved by the sector rotators of 19.15%.

Average Active Share has increased from 56.44% to 56.66% compared to the bull market breaking through a previous high period. Tracking error decreased tremendously from 1.028% in the previous sub-period to 0.637% in the current sub-period. Unit trusts have marginally increased their Active Share over the sub-period, whereas variability as measured by tracking error has almost halved. The statistics highlight how differently the measures interpret activeness.

The highest 3 month alpha earned by any of the unit trusts in the sample was earned by a unit trust within the concentrated stock picker category of 7.37%. The lowest three month alpha was earned by the diversified stock picker group of -10.35%. The sector rotator has a much lower range than that of the concentrated stock picker with a maximum and minimum three month return of 6.95% and -3.95%.

The null hypothesis cannot be rejected for any of the styles. Sector rotator is slightly higher than the 10% statistically significant mark displaying a p-value of 11.0%.

10.2.5. Overall Analysis

The single best and single worst performance over all time periods has been exhibited by the concentrated stock pickers with 18.51% and diversified stock pickers with -6.35%. The most consistent style that has also not exhibited a negative alpha throughout the three periods is sector rotator with 5.17%, 1.34% and 1.92% in period B, period C and period D, respectively.

The lowest standard deviation of returns is exhibited, unsurprisingly, by the closet indexer group with 2.05%. The highest standard deviation is exhibited by the concentrated stock pickers with 13.15%. These findings are intuitively correct as closet indexer should have the lowest variability of returns as they are most closely linked to the benchmark with the lowest Active Share, and tracking error. Concentrated stock pickers are expected to have the highest standard deviation as they have the highest Active Share and tracking error.

Investing in the concentrated stock picker style instead of the closet indexer style would have yielded a difference in alpha of 16.81%, 1.1% and -4.06%. Investing in the Sector rotator picker style instead of the closet indexer style would have yielded a difference in alpha of 3.47%, -0.03% and 0.45%. Investing in the Sector diversified stock picker group instead of the closet indexer style would have yielded a difference in alpha of -8.05%, 0.42% and -2.07%.

Concentrated stock picker displayed the lowest p-value in sub-period and B and C. The null hypothesis relating to concentrated stock picker can be rejected for two of the three sub-periods.

10.3. TER Revision

Total expense ratio (TER) is a measure of the total cost associated with managing and operating a unit trust. The costs are mostly made up of management fees, but also consist of other operational expenses:

$$TER = \frac{total\ expenses}{total\ assets}$$

The measure is of importance to investors because the percentage return that a fund's assets earn is decreased by the fund's TER to arrive at a net return. For example, a return of 6% over a 12 month period will be reduced to 4% if the fund has a TER of 2%.

It is expected that unit trusts with a higher Active Share should charge a higher TER (management fees). A unit trust which is 100% active is required to spend more time and allocate more resources to stock picking analysis compared to a fund which is 0% active. In order for the 100% active fund's management to earn an acceptable profit a higher fee is required to be charged resulting in a higher TER for the fund.

The lowest Active Share group exhibits the lowest TER. One would expect the highest Active Share group to exhibit the highest TER, but instead the TER of the highest Active Share group is slightly below that of the middle group. An adjusted TER can be calculated which incorporates the degree of Active Share:

$$Adjusted\ TER = \frac{TER}{Active\ Share}$$

A fund with a TER of 2% and an Active Share of 100% would have an adjusted TER of 2%. A unit trust with a TER of 2% and an Active Share of 50% would have an adjusted TER of 4%. The TER increases by the extent of closet indexing by the unit trust. The logic is that the unit trust can only charge

management fees on the active portion of the fund. The measure is useful in comparing funds to each other and adjusting the reported TER. The results are similar, if not more pronounced on an adjusted TER basis.

	Average TER	Average Adjusted TER
Active Share level 1	1.29%	2.81%
Active Share level 2	1.66%	3.10%
Active Share level 3	1.64%	2.36%

The funds making up the sample charge varying TERs and exhibit varying degrees of Activeness. A fund that is 100% active and charges 2% management fees per year (fund A) is preferred by an investor in favour of a fund that is 50% active and charges 2% management fees (fund B). The investor, instead of investing in fund B, could invest in an index fund charging 0.5% management fees and a fully active fund charging management fees of 2% in order to achieve a total fee percentage of 1.25% with the same degree of activeness compared to that of fund B. The investor has effectively found an arbitrage opportunity when considering activeness and TER.

Investors can replicate the degree of activeness of a unit trust by investing a certain percentage in an index fund and a certain percentage in a 100% active fund. A fund with 50% activeness can be replicated by investing 50% in an index fund and 50% in a 100% active fund. Using the figures above, such a fund would save 0.75% in fees each year, but achieve the same Active Share ratio. The same exercise can be performed with tracking error if the investor considers tracking error to be a more accurate estimation of risk.

What can be taken from Markowitz (1952) and applied to the Active vs Passive Debate is that investors can sit on the fence instead of picking a side. Replicating the Active funds total risk by investing in a combination of passive and active funds will greatly increase the alpha earned by an

investor by decreasing the total TER. A superior portfolio could be tailored to the individual investor's willingness and ability to take on risk by varying the degree of activeness

10.4. Price vs. Benefit Analysis

Active Share	Average AS	Average TER	% Change in TER	% Change in AS	AS cost	AS marginal cost
Tercile 1	48.37%	1.29%			0.027%	
Tercile 2	56.29%	1.66%	28.40%	16.36%	0.029%	0.58
Tercile 3	67.99%	1.64%	-1.43%	20.79%	0.024%	(14.53)
Active Share	Average Adjusted TER	% Change in Adjusted TER	Average Alpha			
Tercile 1	2.81%		0.10%			
Tercile 2	3.10%	10.49%	0.59%			
Tercile 3	2.36%	-23.95%	0.26%			

A detailed investigation into the pricing of different levels of Active Share and tracking error has been performed and the results are represented above. The average Active Share has been calculated for each fund over the period under review and divided into three groups from lowest to highest Active Share. In line with the expectations one would expect the TER to increase as Active Share increases. Average TER increases by 0.37% from tercile one to two, but decreases by 0.04% from tercile two to three, which is not in line with expectations. The Active Share marginal cost from tercile two to three is -14.53. The average cost per 1% of Active Share is 0.027%, 0.029% and 0.024% for tercile one, two and three, respectively. The change in adjusted TER from tercile one to two and from two to three is 10.49% and -23.95%, respectively, which is more pronounced than that of the change in TER.

Why can unit trust managers exhibiting the highest Active Share not charge higher fees than unit trust managers exhibiting Active Share in the middle of the range? If the level of Active Share associated with tercile three was more beneficial to investors compared to the level associated with tercile two, one would expect the cost to be higher. It appears that the economic rent associated with tercile three is lower than that associated with tercile two. The third level of Active Share is less attractive to investors compared with the second level when considering the price of these two levels. Intuitively, one would expect the highest alpha to be generated from tercile two compared to tercile one and three.

The results are consistent with the expectations with group two exhibiting the highest alpha, followed by group three and group one.

Tracking Error	Average TE	Average TER	% Change in TER	% Change in TE	TE Cost	TE marginal cost	Average Alpha
Tercile 1	2.77%	1.33%			0.479%		0.10%
Tercile 2	3.15%	1.75%	31.91%	13.66%	0.556%	0.43	0.38%
Tercile 3	4.11%	1.52%	-13.15%	30.74%	0.369%	(2.34)	0.47%

The same analysis is performed for tracking error with similar results. Average TER initially increases by 0.42% from tercile one to two and decreases by 0.23% from tercile two to three which is not in line with expectations. The tracking error marginal cost is -2.34 from tercile two to three. The cost for 1% of tracking error is 0.479%, 0.556% and 0.369% for tercile one, two and three. Once again, from a pricing perspective it appears that the highest level of tracking error compared to the middle level of tracking error is less favourable for investors. Intuitively, one would expect the highest alpha to be generated from tercile two compared with one and three. The highest alpha is demonstrated by tercile two instead of tercile three as expected.

10.5. Active Share and Alpha

Active Share is expected to be positively correlated to alpha in line with previous studies. Cremers and Petajisto (2009) find that Active Share predicts fund performance; the funds with the highest Active Share significantly outperform their benchmark indices both before and after expenses, while the non-index funds with the lowest Active Share underperform. Petajisto (2010) find that the only style adding value to investors is active stock pickers (the style is similar to the concentrated stock picker style used in this study), which have beaten their benchmarks by 1.26% after fees and expenses. The active stock picker style is where the highest Active Share quintile and highest tracking error quintile meet.

Unit trusts have been divided into Active Share quintiles over the period and the average 3 month rolling return of each quintile has been calculated. The quintiles have been calculated in such a way to

ensure that there is an even distribution of data points for each quintile. The following table represents the sample statistics of the testing performed:

Active Share	Population	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Count	638	127	127	128	128	128
Mean Alpha	0.46%	0.32%	0.60%	0.52%	0.00%	0.85%
Mean Alpha Annualised	1.85%	1.29%	2.44%	2.08%	0.01%	3.46%
Standard Deviation	4.09%	2.29%	2.93%	3.41%	4.44%	6.21%
Sharpe Ratio	11.23%	13.99%	20.64%	15.16%	0.05%	13.75%
Min	-14.69%	-6.51%	-6.82%	-8.11%	-14.69%	-14.61%
Min Annualised	-47.04%	-23.61%	-24.62%	-28.71%	-47.04%	-46.84%
Median	0.35%	0.26%	0.42%	0.23%	0.29%	0.56%
Median Annualised	1.42%	1.06%	1.68%	0.93%	1.18%	2.24%
Max	32.34%	8.09%	11.11%	13.03%	19.27%	32.34%
Max Annualised	206.74%	36.50%	52.41%	63.22%	102.36%	206.74%
Average Active Share	57.99%	44.23%	52.09%	56.93%	63.04%	74.49%
T-test p-value		2.7%	0.4%	1.5%	22.8%	1.6%

The sample consists of 638 observations in total with between 127 and 128 observations representing each group. The lowest performing group is quintile, 4 exhibiting an annualised alpha of 0.01%, which is not in line with expectations given the findings of Cremers and Petajisto (2009). Ideally one would expect an orderly and consistent increase in alpha from quintile 1 to 5, but instead there is a large decrease in alpha in quintile 4. The benefit of dividing the sample into quintiles instead of quartiles or terciles when considering the variability in returns between quintiles is clear. The null hypothesis can be rejected at the 10% level for all quintiles except for quintile four. The most statistically significant quintile is quintile two with a p-value of 0.4%.[9] The correlation coefficient, demonstrating the correlation between Active Share and alpha (using the inputs above), is 35.85% indicating a mild upward correlation. Regression analysis reveals a R^2 of 12.85% and a p-value of 55.34%.

[9] Refer to appendix for normal test statistics.

The result of the T-test performed indicates that the mean alpha exhibited by concentrated stock picker is statistically greater than the mean alpha demonstrated by closet indexer given the p-value of 6.52%.

10.6. Tracking Error and Alpha

The following table represents the sample statistics of the testing performed:

Tracking Error	Population	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Count	638	127	127	128	128	128
Mean Alpha	0.46%	0.32%	0.56%	0.37%	0.56%	0.49%
Mean Alpha Annualised	1.85%	1.28%	2.24%	1.49%	2.28%	1.97%
Standard Deviation	4.09%	2.83%	3.73%	3.94%	5.59%	3.93%
Sharpe Ratio	11.23%	11.27%	14.87%	9.39%	10.10%	12.45%
Min	-14.69%	-6.89%	-14.69%	-11.44%	-14.61%	-10.35%
Min Annualised	-47.04%	-24.84%	-47.04%	-38.49%	-46.84%	-35.40%
Median	0.35%	0.44%	0.37%	0.05%	0.38%	0.20%
Median Annualised	1.42%	1.77%	1.48%	0.20%	1.54%	0.79%
Max	32.34%	6.81%	12.34%	16.72%	32.34%	15.63%
Max Annualised	206.74%	30.17%	59.27%	85.60%	206.74%	78.77%
Average Tracking Error	0.98%	0.74%	0.82%	0.90%	1.00%	1.39%
T-test p-value		4.2%	1.3%	5.5%	4.3%	1.6%

The sample consists of 638 observations in total with between 127 and 128 observations representing each group. The lowest performing group is quintile 1 exhibiting an annualised alpha of 1.28% which is in line with expectations given the findings of Cremers and Petajisto (2009). Ideally one would expect an orderly and consistent increase in alpha from quintile 1 to 5, but instead there are consistent increases and decreases from quintile 1 to 5. All of the five quintiles display p-values which enable one to reject the null hypothesis at the 10% level.

The correlation coefficient demonstrating the correlation between tracking error and alpha (using the inputs above) is 36.196% indicating a mild upward correlation. Regression analysis reveals a R^2 of 13.10% and a p-value of 54.94%.

The result of the T-test performed indicates that the mean alpha exhibited by concentrated stock picker is not statistically greater than the mean alpha demonstrated by closet indexer given the p-value of 25.93%.

11. Conclusions

11.1. Trends in Active Share

Average aggregate Active Share has decreased from the start to the end of the period on an equally weighted and market weighted basis. Active Share appears to be positively correlated with large movements in the JSE ALSI and negatively correlated to volatility. Active Share provides an absolute measure of Active Share that can be analysed over time. The mean Active Share at the beginning of the period is not statistically different from the mean Active Share at the end of period at the 10% level.

11.2. Fund Flow Analysis

Although the findings are not statistically significant, they indicate that managers are ultimately concerned with fund inflow and outflow and use Active Share to increase the probability of fund inflows and decrease the risk of fund outflows, depending on market conditions and the alpha produced by their fund.

11.3. Risk of Underperformance

The RoU tends to remain around an average and is dependent on levels of volatility and Active Share. It appears that managers tend to use the degree of Active Share to decrease or increase the RoU.

11.4. Trends in Tracking Error

Tracking error appears to be highly correlated to volatility. The measure is not an unbiased estimate of activeness.

11.5. Style and Performance

The concentrated stock pickers far outperform closet indexers. The group with the highest combination of Active Share and tracking error, concentrated stock picker, has outperformed the group with the lowest combination of Active Share and tracking error, closet indexer, by a statistically

significant annualised alpha of 2.07%. The highest performing group is moderately active with an alpha of 3.08%, outperforming closet indexer by 2.42%. At the 10% level the annualised alpha of moderately active, sector rotator, moderately active diversifier, concentrated stock picker and aggressive sector bets are statistically greater than zero.

11.6. Bull and Bear Market Performance

The performance differential between concentrated stock pickers and closet indexers is most pronounced during downturns in the market. During the financial crisis concentrated stock pickers (defined on a 2 by 2 matrix) outperformed closet indexers by an annualised alpha of 16.81%. Concentrated stock picker outperformed all styles during the bull market to previous high sub-period and underperformed all styles during the bull market breaking through previous highs sub-period. The following styles are statistically greater than zero: Concentrated stock picker and sector rotator in sub-period B; Concentrated stock picker, closet indexer and diversified stock picker in sub-period C; and no style in sub-period D.

11.7. TER Revision

A strategy of creating a synthesised "active" unit trust by investing in an index fund and a truly active fund will result in a lower TER paid by an investor for the same amount of activeness.

TER decreases from the second tercile to the third tercile as measured by Active Share and tracking error.

11.8. Active Share and Alpha

The highest level of Active Share earns the highest alpha. The highest level of Active Share outperforms the lowest level of Active Share by a statistically significant annualised alpha of 2.17%.

11.9. Tracking Error and Alpha

The apparent correlation between tracking error and alpha is less apparent than the correlation between that of Active Share and alpha. A positive trend line is evident, although the two highest performing alphas relate to quintile two and four. The alpha associated with the highest level of tracking error is not statistically different to the lowest level of tracking error.

12. Recommendations

Using Active Share and tracking error to categorise unit trusts into different styles allows investors to identify unit trusts that are closet indexers. The process would also enable investors to establish the actual style exhibited by the unit trust. Identifying these styles provides investors with methods to reduce costs and/or achieve higher alphas.

Investors should evaluate the TER charged by unit trusts against the activeness of the unit trust (measured by Active Share) to determine whether the TER is warranted or not.

Investors should consider creating synthesised unit trusts that cater for their ability and willingness to take on risk, as measured by activeness, by combining truly active and passive unit trusts, thereby increasing their investment return by their TER savings.

Investors should discern between funds that are labelled closet indexers (low activeness) and funds that are labelled concentrated stock pickers (high activeness) in order to achieve better downside protection and higher returns.

Unit trust managers should regularly provide investors with their fund's level of Active Share as well as tracking error as Active Share is an absolute measure that can be compared over time and is not affected by volatility.

13. Areas for Future Research

The scope of testing performed in this study could be increased from a time period and number of funds perspective, thereby increasing the total amount of observations. In doing so, one would be able to perform statistical testing on a larger sample.

Active Share contains very high informational content and should be investigated in more detail against other variables in order to ascertain the full extent of its value.

The findings by Cremers and Petajisto (2009) regarding the persistence in Active Share should be tested in the South African market.

The alpha associated with each tercile of TER should be calculated and compared to see if the cost/benefit ratio holds.

The matrix of styles should be revised to be in line with other studies for South African findings to be truly comparable to studies abroad.

The underperformance of the diversified stock picker and aggressive stock picker styles should be investigated in more detail to ascertain the driver behind the underperformance.

The risk of underperformance should be calculated and investigated over a longer period to ascertain the long-term average and short-term divergences from that average.

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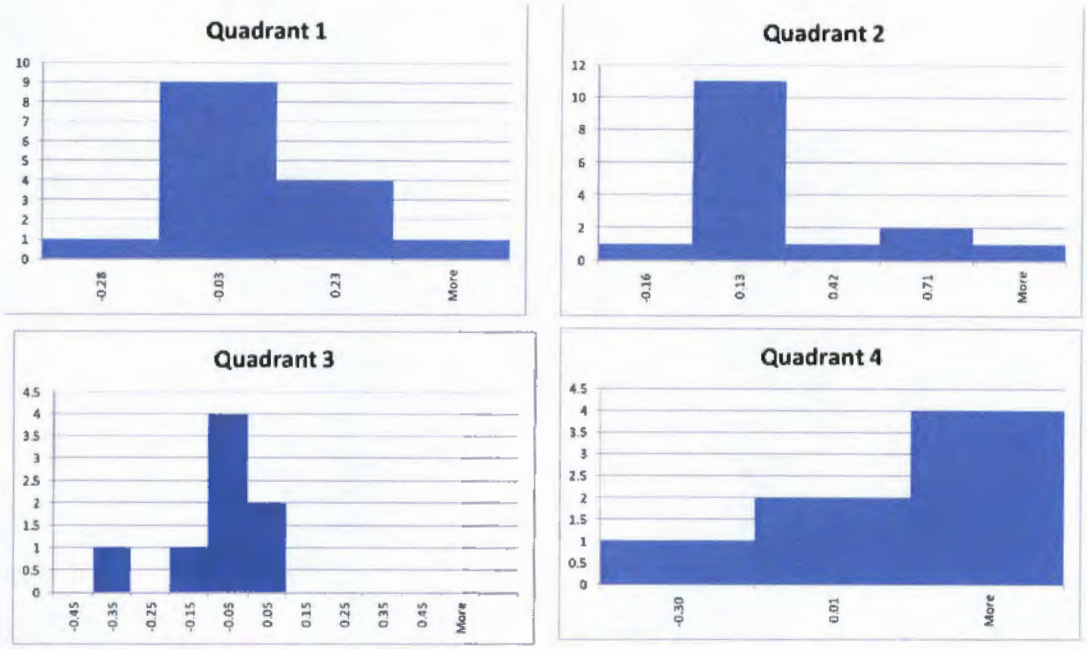
15. Appendix – Normal Test Statistics

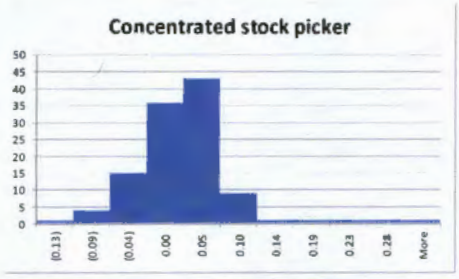
Visual inspections of dataset frequency distributions show either strong or mild indications of normality, except for the frequency distributions relating the fund flow analysis datasets. T-testing was not performed on this data set and instead a Mann-Whitney U-test was performed.

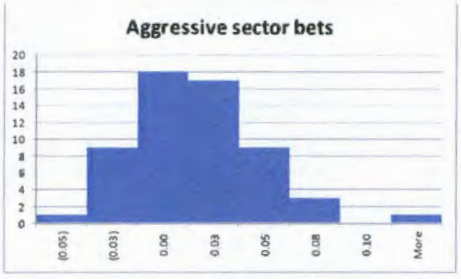
15.1. Fund Flow Analysis

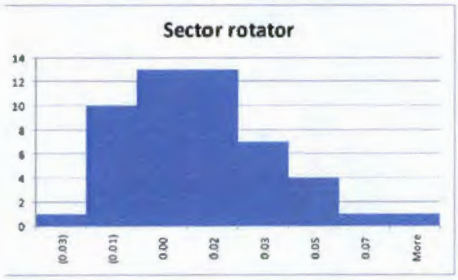


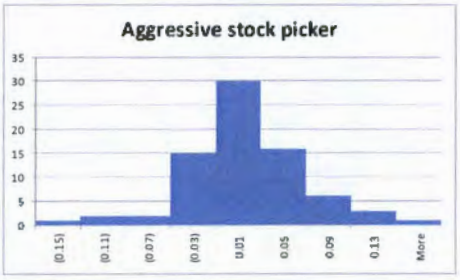
Statistic	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Mean	-4.52%	11.68%	-14.59%	-1.54%
Median	-7.07%	2.59%	-12.20%	9.25%
Skewness	1.80	1.80	(1.47)	(0.06)
Kurtosis	5.53	2.78	2.35	(2.12)

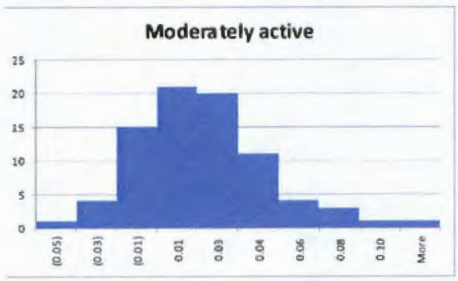
15.2. *Style and Performance*

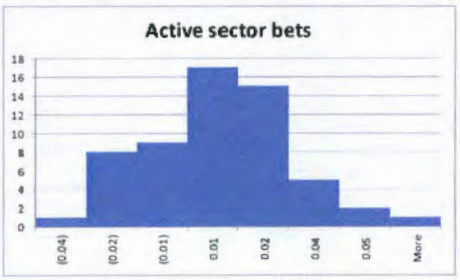


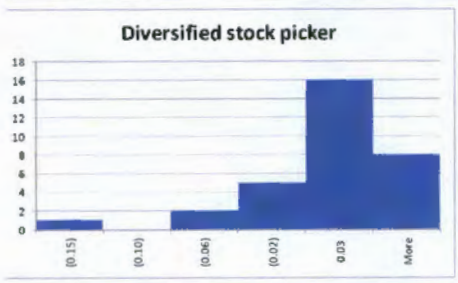


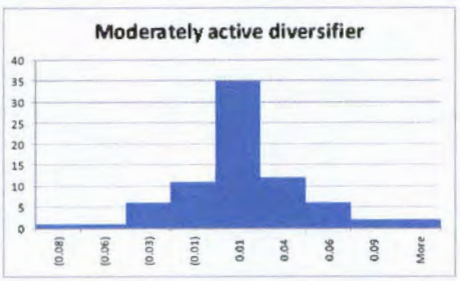


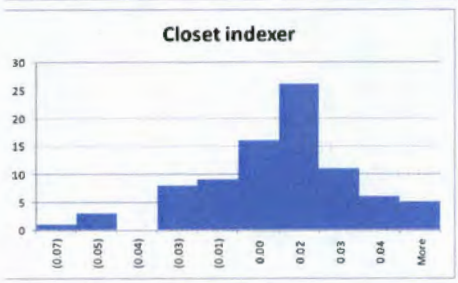








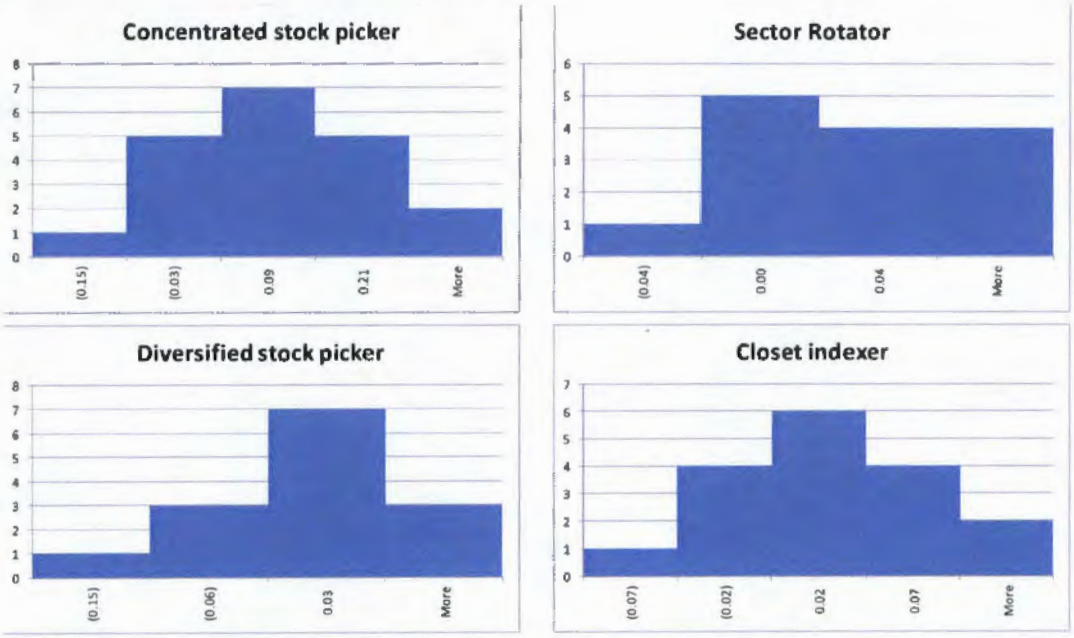




Statistic	Population	Closet Indexer	Moderately Active Diversifier	Diversified Stock Picker	Active Sector Bets	Moderately Active	Aggressive Stock Picker	Sector Rotator	Aggressive Sector Bets	Concentrated Stock Picker
Mean	0.46%	0.17%	0.60%	0.25%	0.10%	0.94%	-0.10%	0.74%	0.57%	0.68%
Median	0.35%	0.39%	0.37%	0.46%	0.30%	0.72%	-0.56%	0.61%	0.18%	0.44%
Skewness	1.35	(0.45)	0.39	(0.98)	0.40	0.77	0.39	0.85	1.03	1.92
Kurtosis	10.18	0.73	1.86	2.39	0.55	1.21	1.74	0.70	2.58	8.16

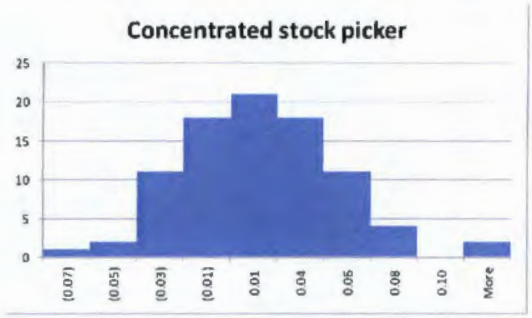
15.3. *Bull and Bear Market Performance*

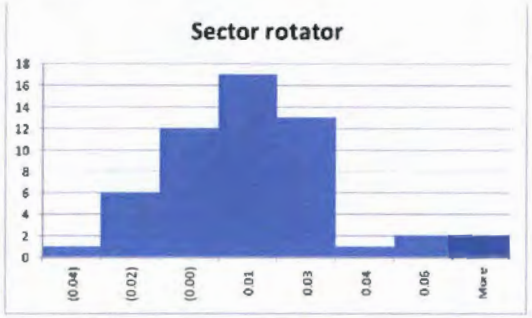
15.3.1. *Results B: Financial Crisis*

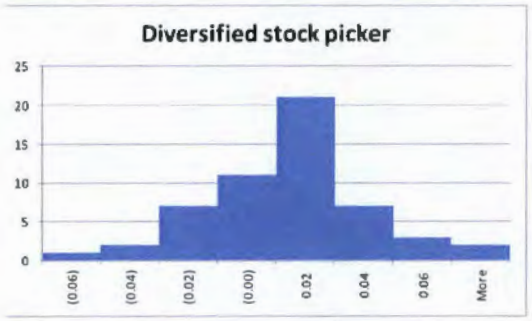


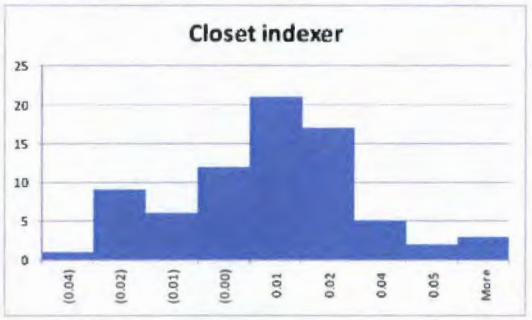
Statistic	Population	Closet Indexer	Diversified Stock Picker	Sector Rotator	Concentrated Stock Picker
Mean	1.35%	0.42%	-1.63%	1.27%	4.34%
Median	0.45%	0.93%	-3.36%	1.58%	2.85%
Skewness	1.02	0.20	0.59	0.40	0.45
Kurtosis	2.08	(0.18)	(0.03)	(1.18)	(0.42)

15.3.2. Results C: Bull Market to Previous High



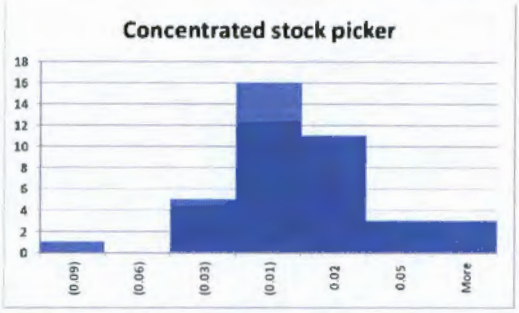


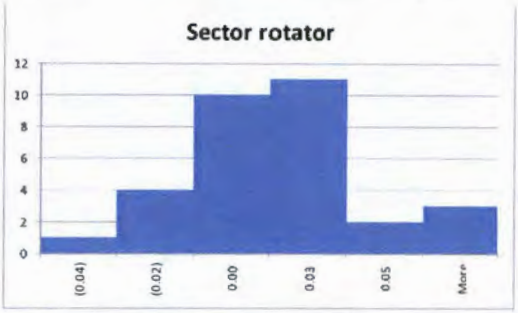


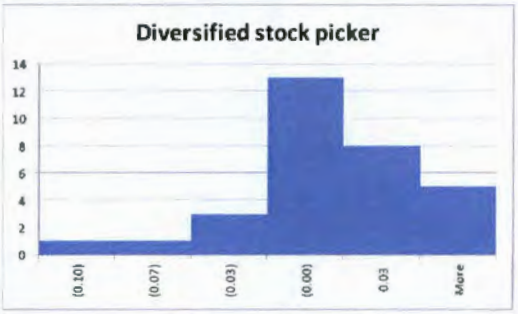


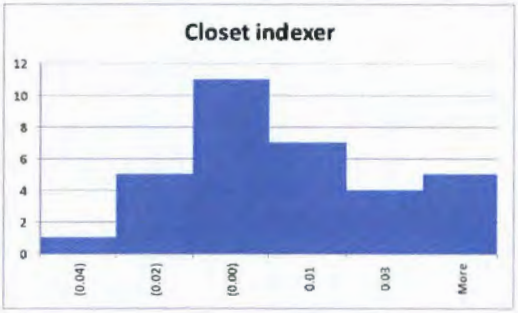
Statistic	Population	Closet Indexer	Diversified Stock Picker	Sector Rotator	Concentrated Stock Picker
Mean	0.45%	0.34%	0.44%	0.33%	0.61%
Median	0.39%	0.39%	0.38%	0.02%	0.66%
Skewness	0.50	0.08	0.19	0.70	0.51
Kurtosis	1.60	0.10	0.77	1.03	1.02

15.3.3. Results D: Bull Market Breaking Through Previous High



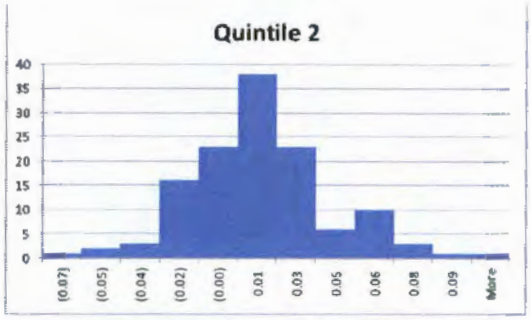


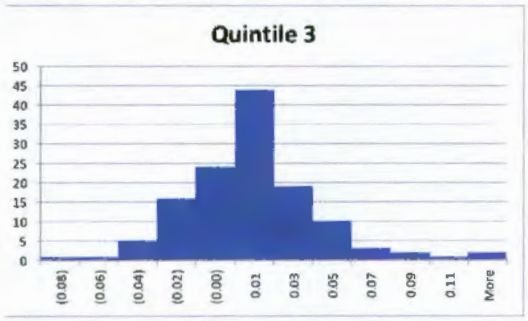


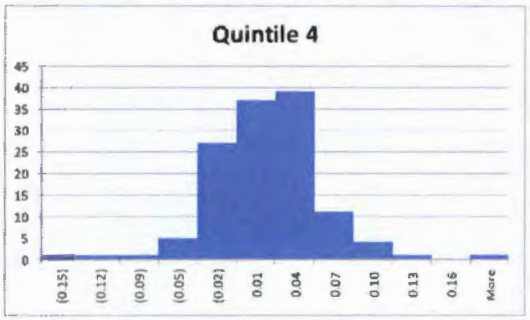


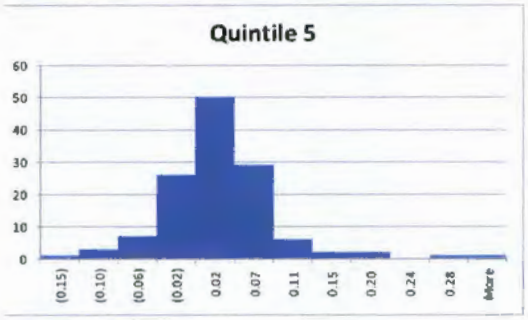
Statistic	Population	Closet Indexer	Diversified Stock Picker	Sector Rotator	Concentrated Stock Picker
Mean	-0.02%	0.37%	-0.15%	0.48%	-0.65%
Median	-0.23%	-0.02%	-0.33%	0.44%	-1.04%
Skewness	(0.15)	0.41	(0.49)	0.50	0.30
Kurtosis	0.95	(0.78)	0.60	0.67	0.78

15.4. *Active Share and Alpha*



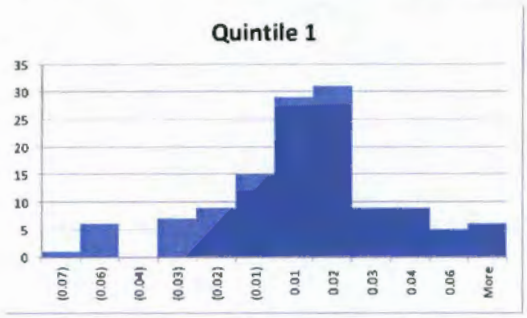


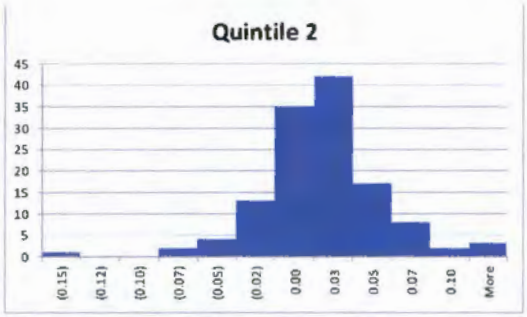


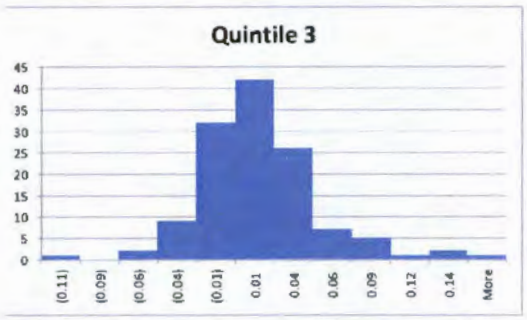


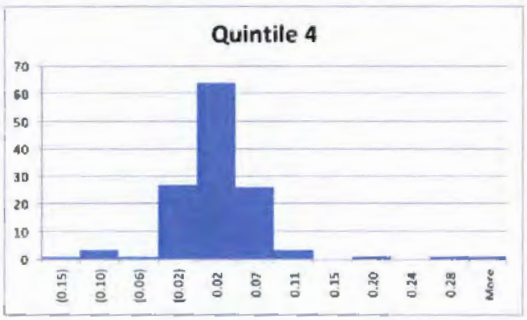
Statistic	Population	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Mean	0.46%	0.32%	0.60%	0.52%	0.00%	0.85%
Median	0.35%	0.26%	0.42%	0.23%	0.29%	0.56%
Skewness	1.35	0.13	0.48	0.80	0.33	1.55
Kurtosis	10.18	0.99	1.17	2.27	3.11	7.09

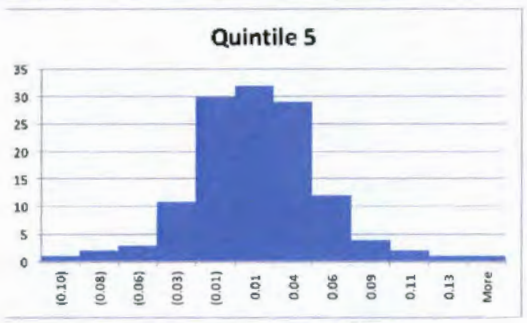
15.5. *Tracking Error and Alpha*











Statistic	Population	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Mean	0.46%	0.32%	0.56%	0.37%	0.56%	0.49%
Median	0.35%	0.44%	0.37%	0.05%	0.38%	0.20%
Skewness	1.35	(0.22)	0.03	0.91	2.16	0.52
Kurtosis	10.18	0.64	2.67	3.08	12.36	2.13